GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

no act
005

Date: February 1, 1977

Project Title: Development of an Urban Peak-Hour Traffic Model Based on the 1970 Census and Concurrent Ground Counts, Phase II

Project No: E-20-609

Project Director: Dr. D. O. Covault

Sponsor: Georgia Department of Transportation

Agreement Period: From 12/13/76 Until ~~2/22~~ 11/15/78

Type Agreement: Contract (GDOT Project No. 7005)

Amount: $37,568 GDOT
4,747 GIT (E-20-343)
$42,315

Reports Required: Quarterly Progress Reports; Executive Summary of Phase I (Stage A); Technical Reports on Stage B and Stage C; Fin. Project Report

Sponsor Contact Person (s):

Technical Matters

Contractual Matters
(thru OCA)

Hugh L. Tyner, P. E., Chief
Research and Development Bureau
Office of Materials and Research
Georgia Department of Transportation
15 Kennedy Drive
Forest Park, GA 30050

Defense Priority Rating: None

Assigned to: Civil Engineering (School/Laboratory)

COPIES TO:

- Project Director
- Division Chief (EES)
- School/Laboratory Director
- Dean/Director—EES
- Accounting Office
- Procurement Office
- Security Coordinator (OCA)
- Reports Coordinator (OCA)
- Library, Technical Reports Section
- Office of Computing Services
- Director, Physical Plant
- EES Information Office
- Project File (OCA)
- Project Code (GTRI)
- Other

CA-3 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

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SPONSORED PROJECT TERMINATION

Date: 10/31/78

Project Title: Development of an Urban Peak Hour Traffic Model Based on the 1970 Census and Concurrent Ground Counts, Phase II.

Project No: E-20-609/A-1998

Project Director: Dr. D. O. Covault/Dr. N. B. Hilsen

Sponsor: Georgia Department of Transportation

Effective Termination Date: 11/15/78

Clearance of Accounting Charges: 11/15/78

Grant/Contract Closeout Actions Remaining:

delay return

- x Final Invoice and Closing Documents
- _ Final Fiscal Report
- _ Final Report of Inventions
- _ Govt. Property Inventory & Related Certificate
- _ Classified Material Certificate
- _ Other _____

Assigned to: Civil Engineering/SED-EES (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director—EES
Accounting Office
Procurement Office
Security Coordinator (OCA) ✓
Reports Coordinator (OCA)
Library, Technical Reports Section
Office of Computing Services
Director, Physical Plant
EES Information Office
Project File (OCA)
Project Code (GTRI)
Other _____

CA—4 (3/76)

E-20-609

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS AND RESEARCH
RESEARCH AND DEVELOPMENT BUREAU

RESEARCH QUARTERLY PROGRESS REPORT

Date of Repor

April 8, 1977

1 Project No. State/Agency	2 Project Title:	3 Quarterly Re
GDOT/G.T. 7005/E20-609	Development of an Urban Peak Hour Traffic Model Based on the 1970 Census and Concurrent Ground Count, Phase II	No. 1 From January, 19 To March, 1977

4 Research Agency	5 Project Director(s)
Georgia Institute of Technology Department of Civil Engineering	Dr. Donald O. Covault Professor

6 Starting Date	7 Completion Date	8 % Time Expended	9 Schedule Status
December 13, 1976	February 22, 1978	20%	☐ Ahead ☒ On ☐ Behind

Funds Authorized		Funds Expended				
10 Total	11 Current Fiscal Year	12 Total to Date	%	13 Current Fiscal Year	%	14 Report Quarter
$37,568	$33,600	$2,761	07	$2,761	08	$2,761

15 Sufficiency of Funds: ☒ Sufficient ☐ Insufficient

16 Progress this Quarter by Phase or Work Item (Reference to Work Plan Schedule, item 26, p. 6):

TASK A-1: Develop Detailed Work Plan (100% completed)

A detailed work plan has been submitted to the Georgia Department of Transportation during this quarter. GDOT has forwarded copies to FHWA comments. It i expected that the work plan will be finalized within the next two weeks.

TASK A-2: Develop Executive Summary of Work Completed in Project 7005 Phase I. (100% completed)

The scope of this task has been expanded to include the reporting of Phase alibrary search and current status of 1980 census. During Phase I, 24-hour traff court data was tabulated for 263 locations with varying roadway classifications. In addition, the Phase I report presented recommendation to alleviate some of the problems encountered with the 1970 census data approach 3 is incorporated as meth 2 in the current research.

Part of the library search included the review of the Comsis Corporation report for Rhode Island. Method 3 has been modified and incorporated in the deta work plan as Method 1. It is anticiapted that this method will be a reasonable approach for the development of a peak hour model for the Atlanta SMSA.

TASK C-2: Determine 1980 Census Status (60% completed)

Initial contacts have been made with the Bureau of Census and FHWA

16 (continued)

representatives. The findings from these conversations are summarized in tl completed Executive Summary as outlined in TASK A-1.

A questionnaire to determine the priority of transportation data has be sent to 20 individuals included in this limited survey are representatives c GDOT, FHWA, a bureau of the census and other census data researchers.

TASK B2-A: Prepare Work Trip Table (15% completed)

Contacts have been made with GDOT and transportation data transfer arra have been completed. It is expected that this effort will be completed shor

(Continue on additional sheets as necessary)

17 Proposed Activity for Next Quarter:

Upon approval of the detailed work plan, the following tasks will either continued or started:

TASK B2-A: Prepare Work Trip Table - To be completed

TASK B-2B: Network Capacity Restraint Assignment - To be 50% completed

Note : Both TASKS B2-A & B2-B correspond to the research connected with Method 2 of the detailed work plan

TASK B3: Other Research Procedures - To be 30% completed

TASK C-1: Interim Report - To be completed

TASK C-2 : Determine 1980 Census Status - To be completed

TASK C-3: Census Questionnaire Criteria - To be completed

(Continue on additional sheets as necessary)

18 Significant Technical Information, Recommendations, Implementation:

In the opinion of the project team, two significant developments have be presented during the quarter.

1. The detailed work plan has been submitted to GDOT and the project te anticipates its approval (with some modification as suggested by the FHWA).
2. The status of the 1980 census as determined by conversations with FH and Bureau of Census. Findings have been sent to GDOT by letter and included in the Executive Summary.

(Continue on additional sheets as necessary)

19 Estimated Funds Expended:

	During Quarter	During Fiscal Year	Total to Dat
Personnel	1566.00	1566.00	
Materials and Supplies	93.00	93.00	
Services	-	-	
Travel	-	-	
Equipment	-	-	
Rental	-	-	
Purchase	-	-	
Overhead (68 %)	$1065.00	$1065.00	
Staff Benefits/Retirement (9.1 %)	37.00	37.00	
Other _____	-	-	
_____	-	-	
TOTAL	$2761	$2761	$2761

20 Project Personnel Time:

Name	Title	% Time or	No. Ho
Dr. Donald O. Covault	Prof. of Civil Engrg.		41.6 ho
M. John Moskaluk	Grad. Student Civil Engrg.		177 ho

21 Project Modification(s) Required: ☒ No ☐ Yes

Reason: ☐ Scope Revision ☐ Fund Increase ☐ Time Extension ☐

Description of Modification(s):

22 Project Communications:

Significant Inspections and Correspondence:

1. The current status and opinions on the 1980 census instrument as expresse by the bureau of census and FHWA have been sent to GDOT.

2. The Executive Summary has been completed and sent to GDOT.

Technical Meetings and Presentations:

The detailed work plan has been presented to GDOT in February, 1977. The plan has been sent to FHWA for approval.

23 Reports

	Dates Due	
	Draft	Final
Work Program	NA	Feb. 15 each year
Interim		
Technical Stage B		November, 1977
Stage C		November, 1977
Special - Executive Summary		March, 1977
Final	January 13, 1978	March 13, 1978
Other Detailed Work Plan		February, 1977

24 Problems:

☒ No

☐ Yes Nature: ☐ Personnel ☐ Technical ☐

Description of Problem:

25 Closing:

Report Prepared by:

Signature

Dr. Donald O. Covault
Name

Professor, Civil Engineering
Title Project Director

Report Approved by:
(if required)

Signature

J. E. Fitzgerald
Name

Director, School of Civil Engineer
Title

1978 Census of the Richmond, Virginia Area

(Richmond City, and Chesterfield and Henrico Counties)

Please fill out this Official Census Form and mail it back on Census Day, Tuesday, April 4, 1978

hown below has the wrong apartment identification, correct apartment number or location here:

	A2.	A4.	A5.	A6.	C.R.
			L		

ers are CONFIDENTIAL by law (title States Code).

ns that no one may see your answers except orkers who are sworn not to disclose your on, and who can be fined and/or imprisoned olation.

so requires that you answer the to the best of your knowledge.

Long Form for "Dress Rehersal" in Richmond, VA

How to Fill This Form

1. Use a black pencil to answer the questions.
This form is read by a computer. Black pencil is better to use than ballpoint or other pens.

Fill circles "○" like this: ●
The computer reads every circle you fill. If you fill the wrong circle, erase the mark completely, then fill the right circle.

When you write in an answer, print or write clearly.

2. See the filled-in example on the yellow instruction sheet.
This example shows how to fill circles and write in answers. If you are not sure of an answer, give the best answer you can.

If you have a problem, look in the instruction sheet.
All instructions are numbered the same as the questions on the census form.

If you need more help, call the Census office.
The telephone number of the local office is shown at the bottom of the address box to the left.

3. Make sure that the information is shown for everyone here.
A boarder, roomer, or someone else in the household may sometimes not want to give you all the information for the form. Write in at least the person's name, relationship, and sex. A Census Taker will call to get the other information directly from the person.

4. Answer the questions on pages 1 through 5, and fill a pair of pages for each person in the household. That is, pages 6 and 7 for the Person in column 1, and pages 8 and 9 for the Person in column 2, and so on. Check your answers. Then, write your name, the date, and telephone number on page 20.

Mail back this form on Tuesday, April 4 or as soon afterward as you can. Use the enclosed envelope; no stamp is needed.

Question 1:

What is the name of each person who was living here on Tuesday, April 4, 1978, or who was staying or visiting here and had no other home?

Instructions:

List in Question 1

- Family members living here, including babies still in the hospital.
- Relatives living here.
- Lodgers or boarders living here.
- Domestic employees or hired hands living here.
- Other persons living here.
- College students who stay here while attending college, even if their parents live elsewhere.
- Persons who usually live here but are temporarily away (including children in boarding school below the college level).
- Persons with a home elsewhere but who stay here most of the week while working.

Do Not List in Question 1

- Any person away from here in the Armed Forces.
- Any college student who stays somewhere else while attending college.
- Any person who usually stays somewhere else most of the week while working there.
- Any person away from here in an institution such as a home for the aged or mental hospital.
- Any person staying or visiting here who has a usual home elsewhere.

NOTE

If everyone here is staying only temporarily and has a usual home elsewhere, please fill this circle ○ . Then please:

- answer the questions on pages 2 through 5 only, and then
- enter the address of your usual home on page 20.

PLEASE CONTINUE

PARA PERSONAS DE HABLA HISPANA (For Spanish-speaking persons):

SI USTED DESEA UN CUESTIONARIO DEL CENSO EN ESPAÑOL, llame a la oficina del censo. El número de teléfono se encuentra más arriba, en la casilla para la dirección al principio de la columna izquierda.

O marque este circulo "O" y devuelva este cuestionario por correo en el sobre color café que aquí se incluye.

T OF COMMERCE
CENSUS
2-19-77)

O.M.B. No. 41-S78006:
Approval Expires June 30, 1979

PLEASE CONTINUE

Also answer the housing questions on page 3.

Also answer the housing

Here are the QUESTIONS ↓

These are the columns for ANSWERS →
Please fill one column for each person listed in Question 1.

	PERSON in column 1	PERSON in column 2	PERSON in column 3	PERSON in column 4	PERSON in column 5	PERSON in
	Last name First name — Middle initial	Last name First name — Middle initial	Last name First name — Middle initial	Last name First name — Middle initial	Last name First name — Middle initial	Last name First name
2. How is this person related to the person in column 1? *Fill one circle.* *If "Other relative" of person in column 1, give exact relationship, such as mother-in-law, niece, grandson, etc.*	*START in this column with the household member (or one of the members) in whose name the home is owned or rented. If there is no such person, start in this column with any adult household member.*	If relative of person in column 1: ○ Husband/wife ○ Father/mother ○ Son/daughter ○ Other relative → ○ Brother/sister If not related to person in column 1: ○ Roomer, boarder ○ Other nonrelative → ○ Partner, roommate ○ Paid employee	If relative of person in column 1: ○ Husband/wife ○ Father/mother ○ Son/daughter ○ Other relative → ○ Brother/sister If not related to person in column 1: ○ Roomer, boarder ○ Other nonrelative → ○ Partner, roommate ○ Paid employee	If relative of person in column 1: ○ Husband/wife ○ Father/mother ○ Son/daughter ○ Other relative → ○ Brother/sister If not related to person in column 1: ○ Roomer, boarder ○ Other nonrelative → ○ Partner, roommate ○ Paid employee	If relative of person in column 1: ○ Husband/wife ○ Father/mother ○ Son/daughter ○ Other relative → ○ Brother/sister If not related to person in column 1: ○ Roomer, boarder ○ Other nonrelative → ○ Partner, roommate ○ Paid employee	If relative of person in co ○ Husband/wife ○ Son/daughter ○ Brother/sister If not related to person in ○ Roomer, boarder ○ Partner, roommate ○ Paid employee
3. Sex *Fill one circle.*	○ Male ■ ○ Female	○ Male ■ ○ Female	○ Male ■ ○ Female	○ Male ■ ○ Female	○ Male ■ ○ Female	○ Male ■
4. Race *Fill one circle.*	○ White ○ Asian Indian ○ Black or Negro ○ Hawaiian ○ Japanese ○ Guamanian ○ Chinese ○ Samoan ○ Filipino ○ Eskimo ○ Korean ○ Aleut ○ Vietnamese ○ Other — *Print race* → ○ Indian (Amer.) *Print tribe* →	○ White ○ Asian Indian ○ Black or Negro ○ Hawaiian ○ Japanese ○ Guamanian ○ Chinese ○ Samoan ○ Filipino ○ Eskimo ○ Korean ○ Aleut ○ Vietnamese ○ Other — *Print race* → ○ Indian (Amer.) *Print tribe* →	○ White ○ Asian Indian ○ Black or Negro ○ Hawaiian ○ Japanese ○ Guamanian ○ Chinese ○ Samoan ○ Filipino ○ Eskimo ○ Korean ○ Aleut ○ Vietnamese ○ Other — *Print race* → ○ Indian (Amer.) *Print tribe* →	○ White ○ Asian Indian ○ Black or Negro ○ Hawaiian ○ Japanese ○ Guamanian ○ Chinese ○ Samoan ○ Filipino ○ Eskimo ○ Korean ○ Aleut ○ Vietnamese ○ Other — *Print race* → ○ Indian (Amer.) *Print tribe* →	○ White ○ Asian Indian ○ Black or Negro ○ Hawaiian ○ Japanese ○ Guamanian ○ Chinese ○ Samoan ○ Filipino ○ Eskimo ○ Korean ○ Aleut ○ Vietnamese ○ Other — *Print race* → ○ Indian (Amer.) *Print tribe* →	○ White ○ Black or Negro ○ Japanese ○ Chinese ○ Filipino ○ Korean ○ Vietnamese ○ Indian (Amer.) *Print tribe* →
5. Age, and month and year of birth *a. Print age at last birthday.* *b. Print month and fill one circle.* *c. Print year in the spaces, and fill one circle below each number.*	a. Age at last birthday c. Year of birth: 1 ● 8 ○ 9 ○ Ø ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ b. Month of birth ■ ○ Jan.—Mar. ○ Apr.—June ○ July—Sept. ○ Oct.—Dec.	a. Age at last birthday c. Year of birth: 1 ● 8 ○ 9 ○ Ø ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ b. Month of birth ■ ○ Jan.—Mar. ○ Apr.—June ○ July—Sept. ○ Oct.—Dec.	a. Age at last birthday c. Year of birth: 1 ● 8 ○ 9 ○ Ø ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ b. Month of birth ■ ○ Jan.—Mar. ○ Apr.—June ○ July—Sept. ○ Oct.—Dec.	a. Age at last birthday c. Year of birth: 1 ● 8 ○ 9 ○ Ø ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ b. Month of birth ■ ○ Jan.—Mar. ○ Apr.—June ○ July—Sept. ○ Oct.—Dec.	a. Age at last birthday c. Year of birth: 1 ● 8 ○ 9 ○ Ø ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ b. Month of birth ■ ○ Jan.—Mar. ○ Apr.—June ○ July—Sept. ○ Oct.—Dec.	a. Age at last birthday c. Year of 1 ● b. Month of birth ■ ○ Jan.—Mar. ○ Apr.—June ○ July—Sept. ○ Oct.—Dec.
6. Marital status *Fill one circle.*	○ Now married ○ Separated ○ Widowed ○ Never married ○ Divorced ■	○ Now married ○ Separated ○ Widowed ○ Never married ○ Divorced ■	○ Now married ○ Separated ○ Widowed ○ Never married ○ Divorced ■	○ Now married ○ Separated ○ Widowed ○ Never married ○ Divorced ■	○ Now married ○ Separated ○ Widowed ○ Never married ○ Divorced ■	○ Now married ○ Widowed ○ Divorced ■
7. Is this person's origin or descent — *Fill one circle.*	○ Mexican-Amer. ○ Cuban ○ Mexican or Chicano ○ Other Spanish ○ Puerto Rican ○ Not Spanish	○ Mexican-Amer. ○ Cuban ○ Mexican or Chicano ○ Other Spanish ○ Puerto Rican ○ Not Spanish	○ Mexican-Amer. ○ Cuban ○ Mexican or Chicano ○ Other Spanish ○ Puerto Rican ○ Not Spanish	○ Mexican-Amer. ○ Cuban ○ Mexican or Chicano ○ Other Spanish ○ Puerto Rican ○ Not Spanish	○ Mexican-Amer. ○ Cuban ○ Mexican or Chicano ○ Other Spanish ○ Puerto Rican ○ Not Spanish	○ Mexican-Amer. ○ Mexican or Chica ○ Puerto Rican ○ Not
8. Since February 1, 1978, has this person attended regular school or college at any time? *Fill one circle. Count nursery school, kindergarten, elementary school and schooling which leads to a high school diploma or college degree.*	○ No, has not attended ○ Yes, public school, public college ○ Yes, private, church-related ○ Yes, private, not church-related	○ No, has not attended ○ Yes, public school, public college ○ Yes, private, church-related ○ Yes, private, not church-related	○ No, has not attended ○ Yes, public school, public college ○ Yes, private, church-related ○ Yes, private, not church-related	○ No, has not attended ○ Yes, public school, public college ○ Yes, private, church-related ○ Yes, private, not church-related	○ No, has not attended ○ Yes, public school, public college ○ Yes, private, church-related ○ Yes, private, not church-related	○ No, has not atter ○ Yes, public schoo ○ Yes, private, chu ○ Yes, private, not
9. What is the highest grade (or year) of regular school this person has ever attended? *Fill one circle.* *If now attending school, mark grade person is in. If high school was finished by equivalency test (GED), mark "12".*	Highest grade attended: ○ Nursery school ○ Kindergarten Elementary through high school *(grade or year)* 1 2 3 4 5 6 7 8 9 10 11 12 College *(academic year)* 1 2 3 4 5 6 7 8 or more ○ Never attended school — *Skip question 10*	Highest grade attended: ○ Nursery school ○ Kindergarten Elementary through high school *(grade or year)* 1 2 3 4 5 6 7 8 9 10 11 12 College *(academic year)* 1 2 3 4 5 6 7 8 or more ○ Never attended school — *Skip question 10*	Highest grade attended: ○ Nursery school ○ Kindergarten Elementary through high school *(grade or year)* 1 2 3 4 5 6 7 8 9 10 11 12 College *(academic year)* 1 2 3 4 5 6 7 8 or more ○ Never attended school — *Skip question 10*	Highest grade attended: ○ Nursery school ○ Kindergarten Elementary through high school *(grade or year)* 1 2 3 4 5 6 7 8 9 10 11 12 College *(academic year)* 1 2 3 4 5 6 7 8 or more ○ Never attended school — *Skip question 10*	Highest grade attended: ○ Nursery school ○ Kindergarten Elementary through high school *(grade or year)* 1 2 3 4 5 6 7 8 9 10 11 12 College *(academic year)* 1 2 3 4 5 6 7 8 or more ○ Never attended school — *Skip question 10*	Highest grade attended: ○ Nursery school Elementary through hi 1 2 3 4 5 6 College *(academic year)* 1 2 3 4 5 6 7 ○ Never attended sc
10. Did this person finish the highest grade (or year) attended? *Fill one circle.*	○ Now attending this grade *(or year)* ○ Finished this grade *(or year)* ○ Did not finish this grade *(or year)*	○ Now attending this grade *(or year)* ○ Finished this grade *(or year)* ○ Did not finish this grade *(or year)*	○ Now attending this grade *(or year)* ○ Finished this grade *(or year)*	○ Now attending this grade *(or year)* ○ Finished this grade *(or year)* ○ Did not finish this grade *(or year)*	○ Now attending this grade *(or year)* ○ Finished this grade *(or year)* ○ Did not finish this grade *(or year)*	○ Now attending th ○ Finished this grad ○ Did not finish thi
	CENSUS USE ONLY A. ○ Inmate ○ Other ○ ○	CENSUS USE ONLY A. ○ Inmate ○ Other ○ ○	CENSUS USE ONLY A. ○ Inmate ○ Other ○ ○	CENSUS USE ONLY A. ○ Inmate ○ Other ○ ○	CENSUS USE ONLY A. ○ Inmate ○ Other ○ ○	CENSUS USE ONLY A. ○ Inma

NOW PLEASE ANSWER QUESTIONS H1-H12 FOR YOUR HOUSEHOLD

If you listed more than 7 persons in Question 1, please see note on page 20.

PERSON in column 7

Last name

First name — Middle initial

If relative of person in column 1:

- ○ Husband/wife
- ○ Son/daughter
- ○ Brother/sister
- ○ Father/mother
- ○ Other relative

If not related to person in column 1:

- ○ Roomer, boarder
- ○ Partner, roommate
- ○ Paid employee
- ○ Other nonrelative

- ○ Male
- ○ Female

- ○ White
- ○ Black or Negro
- ○ Japanese
- ○ Chinese
- ○ Filipino
- ○ Korean
- ○ Vietnamese
- ○ Indian (Amer.) *Print tribe* ———
- ○ Asian Indian
- ○ Hawaiian
- ○ Guamanian
- ○ Samoan
- ○ Eskimo
- ○ Aleut
- ○ Other — *Print race*

a. Age at last birthday

c. Year of birth — 1 ● 8 ○ 9 ○ | Ø ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ | Ø ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○

b. Month of birth

- ○ Jan.–Mar.
- ○ Apr.–June
- ○ July–Sept.
- ○ Oct.–Dec.

- ○ Now married
- ○ Widowed
- ○ Divorced
- ○ Separated
- ○ Never married

- ○ Mexican-Amer.
- ○ Mexican or Chicano
- ○ Puerto Rican
- ○ Cuban
- ○ Other Spanish
- ○ Not Spanish

- ○ No, has not attended
- ○ Yes, public school, public college
- ○ Yes, private, church-related
- ○ Yes, private, not church-related

Highest grade attended:

- ○ Nursery school
- ○ Kindergarten

Elementary through high school *(grade or year)*

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 ○

College *(academic year)*

1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 or more ○

- ○ Never attended school — *Skip question 10*

- ○ Now attending this grade *(or year)*
- ○ Finished this grade *(or year)*
- ○ Did not finish this grade *(or year)*

CENSUS USE ONLY — A. ○ Inmate ○ Other ○ ○

H1. Did you leave anyone out of Question 1 because you were not sure if the person should be listed — *for example, a new baby still in the hospital, a lodger who also has another home, or a person who stays here once in a while and has no other home?*

- ○ Yes — *On page 20 give name(s) and reason left out.*
- ○ No

H2. Did you list anyone in Question 1 who is away from home now — *for example, on a vacation or in a hospital?*

- ○ Yes — *On page 20 give name(s) and reason person is away.*
- ○ No

H3. Is anyone visiting here who is not already listed?

- ○ Yes — *On page 20 give name of each visitor for whom there is no one at the home address to report the person to a census taker.*
- ○ No

H4. What best describes the building in which you live?
Fill one circle.

- ○ A mobile home or trailer
- ○ A one-family house detached from any other house
- ○ A one-family house attached to one or more houses
- ○ Boat, van, tent, etc.

or An apartment house or building with the following number of living quarters:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10 to 19
- ○ 20 to 49
- ○ 50 or more

H5. Do you enter your living quarters —

- ○ Directly from the outside or through a common or public hall?
- ○ Through someone else's living quarters?

H6. Do you have complete plumbing facilities in your living quarters, that is, hot and cold piped water, a flush toilet, and a bathtub or shower?

- ○ Yes, for this household only
- ○ Yes, but also used by another household
- ○ No, have some but not all plumbing facilities
- ○ No plumbing facilities in living quarters

H7. How many rooms do you have in your living quarters?
Do not count bathrooms, porches, balconies, foyers, halls, or half-rooms.

- ○ 1 room
- ○ 2 rooms
- ○ 3 rooms
- ○ 4 rooms
- ○ 5 rooms
- ○ 6 rooms
- ○ 7 rooms
- ○ 8 rooms
- ○ 9 rooms or more

H8. Are your living quarters —

- ○ Owned or being bought by you or by someone else in this household?
- ○ Rented for cash rent?
- ○ Occupied without payment of cash rent?

H9. Is this apartment (house) part of a condominium or cooperative building or development?

- ○ No
- ○ Yes, a condominium building or development
- ○ Yes, a cooperatively - owned building or development

H10. If this is a one-family house —

a. Is the house on a property of 10 acres or more?

- ○ Yes
- ○ No

b. Is any part of the property used as a commercial establishment or medical office?

- ○ Yes
- ○ No

H11. *If you live in a one-family house or a condominium unit which you own or are buying —*

What is the value of this property, that is, how much do you think this property (house and lot or condominium unit) would sell for if it were for sale?

Do not answer this question if this is —

- A mobile home or trailer
- A house on 10 acres or more
- A house with a commercial establishment or medical office on the property

- ○ Less than $5,000
- ○ $5,000 to $9,999
- ○ $10,000 to $14,999
- ○ $15,000 to $17,499
- ○ $17,500 to $19,999
- ○ $20,000 to $22,499
- ○ $22,500 to $24,999
- ○ $25,000 to $27,499
- ○ $27,500 to $29,999
- ○ $30,000 to $32,499
- ○ $32,500 to $34,999
- ○ $35,000 to $37,499
- ○ $37,500 to $39,999
- ○ $40,000 to $44,999
- ○ $45,000 to $49,999
- ○ $50,000 to $54,999
- ○ $55,000 to $59,999
- ○ $60,000 to $69,999
- ○ $70,000 to $79,999
- ○ $80,000 to $89,999
- ○ $90,000 to $99,999
- ○ $100,000 to $149,999
- ○ $150,000 to $199,999
- ○ $200,000 or more

H12. *If you pay rent for your living quarters —*
What is the monthly rent?
If rent is not paid by the month, see the instruction sheet on how to figure a monthly rent.

- ○ Less than $40
- ○ $40 to $49
- ○ $50 to $59
- ○ $60 to $69
- ○ $70 to $79
- ○ $80 to $89
- ○ $90 to $99
- ○ $100 to $109
- ○ $110 to $119
- ○ $120 to $129
- ○ $130 to $139
- ○ $140 to $149
- ○ $150 to $159
- ○ $160 to $169
- ○ $170 to $179
- ○ $180 to $189
- ○ $190 to $199
- ○ $200 to $224
- ○ $225 to $249
- ○ $250 to $274
- ○ $275 to $299
- ○ $300 to $349
- ○ $350 to $399
- ○ $400 or more

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A4. Block number — ○ NC

A6. Serial number

B. Type of unit or quarters

Occupied
- ○ First form
- ○ Continuation

Vacant
- ○ Regular
- ○ Usual home elsewhere

Group quarters
- ○ First form
- ○ Continuation

For Vacant Units

C1. Is this unit for —
- ○ Year round use — *(Fill C2 and C3)*
- ○ Seasonal/Mig.

C2. Vacancy status
- ○ For rent
- ○ For sale only
- ○ Rented or sold, not occupied
- ○ Held for occasional use
- ○ Other vacant

C3. Is this unit boarded up?
- ○ Yes
- ○ No

D. Months vacant
- ○ Less than 1 month
- ○ 1 up to 2 months
- ○ 2 up to 6 months
- ○ 6 up to 12 months
- ○ 1 year up to 2 years
- ○ 2 years or more

E. Quest're codes
1. ○ ○ Mail return
2. ○ ○ Pp. 2/3 Comp.
3. ○ ○ Pop./F

F. Total persons

ALSO ANSWER THESE QUESTIONS

H13a. How many stories (floors) are in this building?

- ○ 1 to 3 — *Skip to H14*
- ○ 4 to 6
- ○ 7 to 12
- ○ 13 stories or more

b. Is there a passenger elevator in this building?

- ○ Yes
- ○ No

H14. About when was this building originally built? *Mark when the building was first constructed, not when it was remodeled, added to, or converted.*

- ○ 1977 or 1978
- ○ 1973 to 1976
- ○ 1970 to 1972
- ○ 1960 to 1969
- ○ 1950 to 1959
- ○ 1940 to 1949
- ○ 1939 or earlier

H15a. Is this building —

- ○ On a city or suburban lot, or on a place of less than 1 acre? — *Skip to H16*
- ○ On a place of 1 to 9 acres?
- ○ On a place of 10 acres or more?

b. Last year, 1977, did sales of crops, livestock, and other farm products from this place amount to —

- ○ Less than $50 (or None)
- ○ $50 to $249
- ○ $250 to $599
- ○ $600 to $999
- ○ $1,000 to $2,499
- ○ $2,500 or more

H16. Do you get water from —

- ○ A public system *(city water department, etc.)* or private company?
- ○ An individual drilled well?
- ○ An individual dug well?
- ○ Some other source *(a spring, creek, river, cistern, etc.)* ?

H17. Is this building connected to a public sewer?

- ○ Yes, connected to public sewer
- ○ No, connected to septic tank or cesspool
- ○ No, use other means

H18. How are your living quarters heated? *Fill one circle for the kind of heat used most.*

- ○ Steam or hot water system
- ○ Central warm-air furnace with ducts to the individual rooms *(Do not count electric heat pumps here.)*
- ○ Electric heat pump
- ○ Other built-in electric units *(permanently installed in wall, ceiling, or baseboard)*
- ○ Floor, wall, or pipeless furnace
- ○ Room heaters with flue or vent, burning gas, oil, or kerosene
- ○ Room heaters without flue or vent, burning gas, oil, or kerosene *(not portable)*
- ○ Fireplaces, stoves, or portable room heaters of any kind
- ○ No heating equipment

H19a. Which fuel is used most for house heating?

- ○ Gas: from underground pipes serving the neighborhood
- ○ Gas: bottled, tank, or LP
- ○ Electricity
- ○ Fuel oil, kerosene, etc.
- ○ Coal or coke
- ○ Wood
- ○ Other fuel
- ○ No fuel used

b. Which fuel is used most for water heating?

- ○ Gas: from underground pipes serving the neighborhood
- ○ Gas: bottled, tank, or LP
- ○ Electricity
- ○ Fuel oil, kerosene, etc.
- ○ Coal or coke
- ○ Wood
- ○ Other fuel
- ○ No fuel used

c. Which fuel is used most for cooking?

- ○ Gas: from underground pipes serving the neighborhood
- ○ Gas: bottled, tank, or LP
- ○ Electricity
- ○ Fuel oil, kerosene, etc.
- ○ Coal or coke
- ○ Wood
- ○ Other fuel
- ○ No fuel used

H20. What are the costs of utilities and fuels for your living quarters?

a. Electricity

$ _____ .00 OR *Average monthly cost*

- ○ Included in rent or no charge
- ○ Electricity not used

b. Gas

$ _____ .00 OR *Average monthly cost*

- ○ Included in rent or no charge
- ○ Gas not used

c. Water

$ _____ .00 OR *Yearly cost*

- ○ Included in rent or no charge

d. Oil, coal, kerosene, wood, etc.

$ _____ .00 OR *Yearly cost*

- ○ Included in rent or no charge
- ○ These fuels not used

H21. Do you have complete kitchen facilities? *Complete kitchen facilities are a sink with piped water, a range or cookstove, and refrigerator.*

- ○ Yes
- ○ No

H22. How many bedrooms do you have?
Count rooms used mainly for sleeping even if used also for other purposes.

- ○ No bedroom
- ○ 1 bedroom
- ○ 2 bedrooms
- ○ 3 bedrooms
- ○ 4 bedrooms
- ○ 5 bedrooms or more

H23. How many bathrooms do you have?
A complete bathroom is a room with flush toilet, bathtub or shower, and wash basin with piped water.

A half bathroom has at least a flush toilet or bathtub or shower, but does not have all the facilities for a complete bathroom.

- ○ No bathroom, or only a half bathroom
- ○ 1 complete bathroom
- ○ 1 complete bathroom, plus half bath(s)
- ○ 2 or more complete bathrooms

H24a. Does this house (apartment) have open cracks or holes in the interior walls or ceiling?
Do not include hairline cracks.

- ○ Yes
- ○ No

b. Does this house (apartment) have holes in the floors?

- ○ Yes
- ○ No

H25. Is there any area of broken plaster on the ceiling or inside walls which is larger than the size of this page?

- ○ Yes
- ○ No

H26. Is there any area of peeling paint on the ceiling or inside walls which is larger than the size of this page?

- ○ Yes
- ○ No

H27. Do you have a telephone in your living quarters?

- ○ Yes
- ○ No

H28. Do you have air-conditioning?

- ○ Yes, a central air-conditioning system
- ○ Yes, 1 individual room unit
- ○ Yes, 2 or more individual room units
- ○ No

H29. How many automobiles are kept at home for use by members of your household?

- ○ None
- ○ 1 automobile
- ○ 2 automobiles
- ○ 3 or more automobiles

H30. How many vans or trucks of one-ton capacity or less are kept at home for use by members of your household?

- ○ None
- ○ 1 van or truck
- ○ 2 vans or trucks
- ○ 3 or more vans or trucks

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H20a.
H20b.
H20c.
H20d.
PH ○ ○

OR YOUR HOUSEHOLD

Please answer H31–H34 if you live in a one-family house which you own or are buying, unless this is –

- A mobile home or trailer
- A house on 10 acres or more
- A cooperative or condominium unit
- A house with a commercial establishment or medical office on the property

If any of these, or if you rent your unit or this is a multi-family structure, skip H31 to H34 and turn to page 6.

H31. What were the real estate taxes on this property last year?

$ _____ .00 OR ○ None

H32. What is the annual premium for fire and hazard insurance on this property?

$ _____ .00 OR ○ None

H33a. Do you have a mortgage, deed of trust, contract to purchase or similar debt on this property?

- ○ Yes, mortgage, deed of trust, or similar debt
- ○ Yes, contract to purchase
- ○ No – *Skip to H34*

b. Do you have a second or junior mortgage on this property?

- ○ Yes
- ○ No

c. How much is your total regular monthly payment to the lender?
Also include payments on a contract to purchase and to lenders holding second or junior mortgages on this property.

$ _____ .00 OR ○ No regular payment required – *Skip to H34*

d. Does your regular monthly payment (amount entered in H33c) include payments for real estate taxes on this property?

- ○ Yes, taxes included in payment
- ○ No, taxes paid separately or taxes not required

e. Does your regular monthly payment (amount entered in H33c) include payments for fire and hazard insurance on this property?

- ○ Yes, insurance included in payment
- ○ No, insurance paid separately or no insurance

H34. Do you have a property improvement loan for repair, rehabilitation, or improvement of this property?

- ○ Yes
- ○ No

Please turn to page 6

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① S.S. Yes ○ No ○	2.	4.	② S.S. Yes ○ No ○	2.	4.	③ S.S. Yes ○ No ○	2.	4.	④ S.S. Yes ○ No ○	2.	4.
⑤ S.S. Yes ○ No ○	2.	4.	⑥ S.S. Yes ○ No ○	2.	4.	⑦ S.S. Yes ○ No ○	2.	4.	GQ.	H31.	H32.	H33c.

ANSWER THESE QUESTIONS FOR

Name of Person 1 on page 2

Last name First name Middle initial

11. In what State or foreign country was this person born?

Print the State where this person's mother was living when this person was born. Do not give the location of the hospital unless the mother's home and the hospital were in the same State.

Be sure to name the State of birth, even if this person no longer lives in that State.

Name of State or foreign country; or Puerto Rico, Guam, etc.

12. *If this person was born in a foreign country –*

a. Is this person a naturalized citizen of the United States?

- ○ Yes, a naturalized citizen
- ○ No, not a citizen
- ○ Born abroad of American parents

b. When did this person come to the United States to stay?

- ○ 1975 to 1978
- ○ 1970 to 1974
- ○ 1965 to 1969
- ○ 1960 to 1964
- ○ 1950 to 1959
- ○ Before 1950

13. What is this person's ancestry?

If uncertain about how to report ancestry, see instruction sheet.

(For example – Afro-Amer., English, French, German, Honduran, Hungarian, Italian, Jamaican, Korean, Lebanese, Mexican, Nigerian, Polish, Ukrainian, Venezuelan, etc.)

14a. Does this person speak a language other than English at home?

- ○ Yes
- ○ No, only speaks English – *Skip to 15*

b. What is this language?

(For example – Chinese, Italian, Spanish, etc.)

c. Does this person speak this language at home more often than English?

- ○ Yes, more often than English
- ○ No, less often than English
- ○ Doesn't speak English

15. When did this person move into this house (or apartment)?

- ○ 1973 to 1978
- ○ 1970 to 1972
- ○ 1960 to 1969
- ○ 1950 to 1959
- ○ 1949 or earlier
- ○ Always lived here

16a. Did this person live in this house five years ago (April 1, 1973)? *If in college or Armed Forces in April 1973, report place of residence there.*

- ○ Born April 1973 or later – *Turn to next page for next person*
- ○ Yes, this house – *Skip to 17*
- ○ No, different house

b. Where did this person live five years ago (April 1, 1973)?

(1) State, foreign country, Puerto Rico, Guam, etc.:

(2) County:

(3) City, town, village, etc.:

(4) Inside the incorporated (legal) limits of that city, town, village, etc.?

- ○ Yes
- ○ No, in unincorporated area

17. When was this person born?

- ○ Born before April 1964 – *Please go on with questions 18–34*
- ○ Born April 1964 or later – *Turn to next page for next person.*

18. In April 1973 *(five years ago)* **was this person –**

a. On active duty in the Armed Forces?

- ○ Yes
- ○ No

b. Attending college?

- ○ Yes
- ○ No

c. Working at a job or business?

- ○ Yes, full time
- ○ Yes, part time
- ○ No

19a. Is this person a veteran of active-duty military service in the Armed Forces of the United States? *If service was in National Guard or Reserves only, see instruction sheet.*

- ○ Yes
- ○ No – *Skip to 20*

b. Was active duty military service during – *(Fill a circle for each period in which this person served.)*

- ○ May 1975 or later
- ○ Vietnam era *(August 1964–April 1975)*
- ○ February 1955–July 1964
- ○ Korean conflict *(June 1950–January 1955)*
- ○ World War II *(September 1940–July 1947)*
- ○ World War I *(April 1917–November 1918)*
- ○ Any other time

20. Does this person have a physical, mental, or other health condition which . . . *See instruction sheet for definition of health condition.*

	Yes	No
a. Limits the kind or amount of work this person can do at a job?	○	○
b. Prevents this person from working at a job?	○	○
c. Limits or prevents this person from using public transportation?	○	○

21. *If this person is a female –*

How many babies has she ever had, not counting stillbirths?

Do not count her stepchildren or children she has adopted.

None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 or more ○

22. *If this person has ever been married –*

a. Has this person been married more than once?

- ○ Once
- ○ More than once

b. Month and year of marriage? *(Month) (Year)*

Month and year of first marriage? *(Month) (Year)*

c. *If married more than once* **– Did the first marriage end because of the death of the husband (or wife)?**

- ○ Yes
- ○ No

23a. Did this person work at any time last week?

- ○ Yes – *Fill this circle if this person worked full time or part time. (Count part-time work such as delivering papers, or helping without pay in a family business or farm. Also count active duty in the Armed Forces.)*
- ○ No – *Fill this circle if this person did not work, or did only own housework, school work, or volunteer work.*

Skip to 26

b. How many hours did this person work last week (at all jobs)?

Subtract any time off; add overtime or extra hours worked.

Hours

24. At what location did this person work last week?

If this person worked at more than one location, print where he or she worked most last week.

If one location cannot be specified, see instruction sheet.

a. Address *(Number and street)*

If street address is not known, enter the building name, shopping center, or other physical location description.

b. Name of city, town, village, borough, etc.

c. Is the place of work inside the incorporated (legal) limits of that city, town, village, borough, etc.?

- ○ Yes
- ○ No, in unincorporated area

d. County

e. State **f. ZIP Code**

25a. Last week, how long did it usually take this person to get from home to work (one way)?

Minutes

b. How did this person usually get to work last week? *If this person used more than one method, give the one usually used for most of the distance.*

- ○ Car
- ○ Truck
- ○ Van
- ○ Bus or streetcar
- ○ Railroad
- ○ Subway or elevated
- ○ Taxicab
- ○ Walked only
- ○ Worked at home
- ○ Other – *Specify*

If car, truck, or van in 25b, go to 25c. Otherwise, skip to 29.

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11.	13.	W.	14b.	16b.	22b.	23b.	24.	VL
⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9	⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9	⊘ 1 2 3 4 5 6 7 8 9	⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9	⊘ ⊘ ⊘ ⊘ ⊘ ⊘ 1 1 1 1 1 1 2 2 2 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 5 5 5 5 5 5 6 6 6 6 6 6 7 7 7 7 7 7 8 8 8 8 8 8 9 9 9 9 9 9	⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9	⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9	⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

D-2(Y)

PERSON 1 ON PAGE 2

c. When going to work last week, did this person usually –

○ Drive alone – *Skip to 29* ○ Drive others only
○ Share driving ○ Ride as passenger only

d. How many people, including this person, usually rode to work in the car, truck, or van last week?

After answering 25d, skip to 29.

26. Was this person temporarily absent or on layoff from a job or business last week?

○ Yes, on layoff
○ Yes, on vacation, temporary illness, labor dispute, etc.
○ No

27a. Has this person been looking for work during the past 4 weeks?

○ Yes ○ No – *Skip to 28*

b. Could this person have taken a job last week?

○ No, already has a job
○ No, temporarily ill
○ No, other reasons *(in school, etc.)*
○ Yes, could have taken a job

28. When did this person last work, even for a few days?

○ 1978 ○ 1972 to 1975 ○ 1967 or earlier } *Skip*
○ 1977 ○ 1968 to 1971 ○ Never worked } *to 33*
○ 1976

29–31. Current or most recent job activity

Describe clearly this person's chief job activity or business last week.
If this person had more than one job, describe the one at which this person worked the most hours.
If this person had no job or business last week, give information for last job or business since 1968.

29. Industry

a. For whom did this person work? *If now on active duty in the Armed Forces, print "AF" and skip to question 32.*

(Name of company, business, organization, or other employer)

b. What kind of business or industry was this?
Describe activity at location where employed.

(For example: Junior high school, retail supermarket, dairy farm, TV and radio service, auto assembly plant, road construction)

c. Is this mainly – *(Fill one circle)*

○ Manufacturing ○ Retail trade
○ Wholesale trade ○ Other – *(agriculture, construction, service, government, etc.)*

30. Occupation

a. What kind of work was this person doing?

(For example: TV repair, sewing machine operator, spray painter, civil engineer, farm operator, farm work, junior high English teacher)

b. What were this person's most important activities or duties?

(For example: Types, keeps account books, files, sells cars, operates printing press, cleans buildings, finishes concrete)

31. Was this person – *(Fill one circle)*

Employee of private company, business, or individual, for wages, salary, or commissions ... ○
Federal government employee ... ○
State government employee ... ○
Local government employee *(city, county, etc.)* ... ○
Self-employed in own business, professional practice, or farm –
Own business not incorporated ... ○
Own business incorporated ... ○
Working without pay in family business or farm ... ○

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25a. ∅ ∅ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

25d. ∅ ∅ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

29. A B C ○ ○ ○ D E F ○ ○ ○ G H J ○ ○ ○ K L M ○ ○ ○ ∅ ∅ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 AF ○ NW ○

30. N P Q ○ ○ ○ R S T ○ ○ ○ U V W ○ ○ ○ X Y Z ○ ○ ○ ∅ ∅ ∅ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 8 8 9 9

32a. Last year (1977), did this person work, even for a few days, at a paid job or in a business or farm?

○ Yes ○ No – *Skip to 33*

b. How many weeks did this person work in 1977?
Count paid vacation, paid sick leave, and military service.

Weeks

c. During the weeks worked in 1977, how many hours did this person usually work each week?

Hours

33. Income in 1977 –

Fill circles and print dollar amounts.
If net income was a loss, write "Loss" above the dollar amount.
If exact amount is not known, give best estimate. For income received jointly by household members, see instruction sheet.

During 1977 did this person receive any income from the following sources?

If "Yes" to any of the sources below – How much did this person receive for the entire year?

a. Wages, salary, commissions, bonuses, or tips from all jobs ...
Report amount before deductions for taxes, bonds, dues, or other items.

○ Yes → $ .00
○ No *(Dollars only)*

b. Own nonfarm business, partnership, or professional practice ...
Report net income after business expenses.

○ Yes → $ .00
○ No *(Dollars only)*

c. Own farm ...
Report net income after operating expenses. Include earnings as a tenant farmer or sharecropper.

○ Yes → $ .00
○ No *(Dollars only)*

d. Interest, dividends, royalties, or net rental income ...
Report even small amounts credited to an account.

○ Yes → $ .00
○ No *(Dollars only)*

e. Social Security or Railroad Retirement ...

○ Yes → $ .00
○ No *(Dollars only)*

f. Supplemental Security (SSI), Aid to Families with Dependent Children (AFDC), or other public assistance or public welfare payments ...

○ Yes → $ .00
○ No *(Dollars only)*

g. Unemployment compensation, veterans' payments, pensions, alimony or child support, or any other sources of income received regularly ...
Exclude lump-sum payments such as money from an inheritance or the sale of a home.

○ Yes → $ .00
○ No *(Dollars only)*

34. What was this person's total income in 1977?

$ .00
(Dollars only)
OR ○ None

Add entries in questions 33a through g; subtract any losses.
If total amount was a loss, write "Loss" above amount.

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32b. ∅ ∅ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

32c. ∅ ∅ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Person number 1 2 3 4 5 6 7 ∅

33a. ∅ ∅ ∅ ∅ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33b. ∅ ∅ ∅ ∅ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33c. ∅ ∅ ∅ ∅ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33d. ∅ ∅ ∅ ∅ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33e. ∅ ∅ ∅ ∅ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

33f. ∅ ∅ ∅ ∅ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

33g. ∅ ∅ ∅ ∅ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

34. ∅ ∅ ∅ ∅ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

X. 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Y. 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Z. 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 8 8 9 9

9 8 7 6 5 4 3 ● 1

9 8 ● 6 5 4 3 2 1

ANSWER THESE QUESTIONS FOR

Name of Person 2 on page 2

Last name First name Middle initial

11. In what State or foreign country was this person born?

Print the State where this person's mother was living when this person was born. Do not give the location of the hospital unless the mother's home and the hospital were in the same State.

Be sure to name the State of birth, even if this person no longer lives in that State.

Name of State or foreign country; or Puerto Rico, Guam, etc.

12. *If this person was born in a foreign country –*

a. Is this person a naturalized citizen of the United States?

- ○ Yes, a naturalized citizen
- ○ No, not a citizen
- ○ Born abroad of American parents

b. When did this person come to the United States to stay?

- ○ 1975 to 1978
- ○ 1965 to 1969
- ○ 1950 to 1959
- ○ 1970 to 1974
- ○ 1960 to 1964
- ○ Before 1950

13. What is this person's ancestry?

If uncertain about how to report ancestry, see instruction sheet.

(For example – Afro-Amer., English, French, German, Honduran, Hungarian, Italian, Jamaican, Korean, Lebanese, Mexican, Nigerian, Polish, Ukrainian, Venezuelan, etc.)

14a. Does this person speak a language other than English at home?

- ○ Yes
- ○ No, only speaks English – *Skip to 15*

b. What is this language?

(For example – Chinese, Italian, Spanish, etc.)

c. Does this person speak this language at home more often than English?

- ○ Yes, more often than English
- ○ No, less often than English
- ○ Doesn't speak English

15. When did this person move into this house (or apartment)?

- ○ 1973 to 1978
- ○ 1960 to 1969
- ○ 1949 or earlier
- ○ 1970 to 1972
- ○ 1950 to 1959
- ○ Always lived here

16a. Did this person live in this house five years ago (April 1, 1973)? *If in college or Armed Forces in April 1973, report place of residence there.*

- ○ Born April 1973 or later – *Turn to next page for next person*
- ○ Yes, this house – *Skip to 17*
- ○ No, different house

b. Where did this person live five years ago (April 1, 1973)?

(1) State, foreign country, Puerto Rico, Guam, etc.: _____

(2) County: _____

(3) City, town, village, etc.: _____

(4) Inside the incorporated (legal) limits of that city, town, village, etc.?

- ○ Yes
- ○ No, in unincorporated area

17. When was this person born?

- ○ Born before April 1964 – *Please go on with questions 18–34*
- ○ Born April 1964 or later – *Turn to next page for next person.*

18. In April 1973 *(five years ago)* **was this person –**

a. On active duty in the Armed Forces?

- ○ Yes
- ○ No

b. Attending college?

- ○ Yes
- ○ No

c. Working at a job or business?

- ○ Yes, full time
- ○ Yes, part time
- ○ No

19a. Is this person a veteran of active-duty military service in the Armed Forces of the United States? *If service was in National Guard or Reserves only, see instruction sheet.*

- ○ Yes
- ○ No – *Skip to 20*

b. Was active duty military service during – *(Fill a circle for each period in which this person served.)*

- ○ May 1975 or later
- ○ Vietnam era *(August 1964–April 1975)*
- ○ February 1955–July 1964
- ○ Korean conflict *(June 1950–January 1955)*
- ○ World War II *(September 1940–July 1947)*
- ○ World War I *(April 1917–November 1918)*
- ○ Any other time

20. Does this person have a physical, mental, or other health condition which . . . *See instruction sheet for definition of health condition.*

	Yes	No
a. Limits the kind or amount of work this person can do at a job?	○	○
b. Prevents this person from working at a job?	○	○
c. Limits or prevents this person from using public transportation?	○	○

21. *If this person is a female –* **How many babies has she ever had, not counting stillbirths?** *Do not count her stepchildren or children she has adopted.*

None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 or more ○

22. *If this person has ever been married –*

a. Has this person been married more than once?

- ○ Once
- ○ More than once

b. Month and year of marriage? *(Month) (Year)*

Month and year of first marriage? *(Month) (Year)*

c. *If married more than once* **– Did the first marriage end because of the death of the husband (or wife)?**

- ○ Yes
- ○ No

23a. Did this person work at any time last week?

- ○ Yes – *Fill this circle if this person worked full time or part time. (Count part-time work such as delivering papers, or helping without pay in a family business or farm. Also count active duty in the Armed Forces.)*
- ○ No – *Fill this circle if this person did not work, or did only own housework, school work, or volunteer work.*

Skip to 26

b. How many hours did this person work last week (at all jobs)? *Subtract any time off; add overtime or extra hours worked.*

Hours _____

24. At what location did this person work last week? *If this person worked at more than one location, print where he or she worked most last week.*

If one location cannot be specified, see instruction sheet.

a. Address *(Number and street)* _____

If street address is not known, enter the building name, shopping center, or other physical location description.

b. Name of city, town, village, borough, etc.

c. Is the place of work inside the incorporated (legal) limits of that city, town, village, borough, etc.?

- ○ Yes
- ○ No, in unincorporated area

d. County _____

e. State _____ **f. ZIP Code** _____

25a. Last week, how long did it usually take this person to get from home to work (one way)?

Minutes _____

b. How did this person usually get to work last week? *If this person used more than one method, give the one usually used for most of the distance.*

- ○ Car
- ○ Truck
- ○ Van
- ○ Bus or streetcar
- ○ Railroad
- ○ Subway or elevated
- ○ Taxicab
- ○ Walked only
- ○ Worked at home
- ○ Other – *Specify*

If car, truck, or van in 25b, go to 25c. Otherwise, skip to 29.

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11.	13.	W.	14b.	16b.	22b.	23b.	24.	VL
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

c. When going to work last week, did this person usually —

○ Drive alone — *Skip to 29* ○ Drive others only
○ Share driving ○ Ride as passenger only

d. How many people, including this person, usually rode to work in the car, truck, or van last week?

After answering 25d, skip to 29.

26. Was this person temporarily absent or on layoff from a job or business last week?

○ Yes, on layoff
○ Yes, on vacation, temporary illness, labor dispute, etc.
○ No

27a. Has this person been looking for work during the past 4 weeks?

○ Yes ○ No — *Skip to 28*

b. Could this person have taken a job last week?

○ No, already has a job
○ No, temporarily ill
○ No, other reasons *(in school, etc.)*
○ Yes, could have taken a job

28. When did this person last work, even for a few days?

○ 1978 ○ 1972 to 1975 ○ 1967 or earlier
○ 1977 ○ 1968 to 1971 ○ Never worked
○ 1976

Skip to 33

29–31. Current or most recent job activity

Describe clearly this person's chief job activity or business last week. If this person had more than one job, describe the one at which this person worked the most hours.

If this person had no job or business last week, give information for last job or business since 1968.

29. Industry

a. For whom did this person work? *If now on active duty in the Armed Forces, print "AF" and skip to question 32.*

(Name of company, business, organization, or other employer)

b. What kind of business or industry was this?

Describe activity at location where employed.

(For example: Junior high school, retail supermarket, dairy farm, TV and radio service, auto assembly plant, road construction)

c. Is this mainly — *(Fill one circle)*

○ Manufacturing ○ Retail trade
○ Wholesale trade ○ Other — *(agriculture, construction, service, government, etc.)*

30. Occupation

a. What kind of work was this person doing?

(For example: TV repair, sewing machine operator, spray painter, civil engineer, farm operator, farm work, junior high English teacher)

b. What were this person's most important activities or duties?

(For example: Types, keeps account books, files, sells cars, operates printing press, cleans buildings, finishes concrete)

31. Was this person — *(Fill one circle)*

Employee of private company, business, or individual, for wages, salary, or commissions . . . ○
Federal government employee . . . ○
State government employee . . . ○
Local government employee *(city, county, etc.)* . . . ○
Self-employed in own business, professional practice, or farm —
Own business not incorporated . . . ○
Own business incorporated . . . ○
Working without pay in family business or farm . . . ○

CENSUS USE

25a. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

25d. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

29. A B C ○ ○ ○ D E F ○ ○ ○ G H J ○ ○ ○ K L M ○ ○ ○ ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 AF ○ NW ○

30. N P Q ○ ○ ○ R S T ○ ○ ○ U V W ○ ○ ○ X Y Z ○ ○ ○ ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 8 8 9 9

32a. Last year (1977), did this person work, even for a few days, at a paid job or in a business or farm?

○ Yes ○ No — *Skip to 33*

b. How many weeks did this person work in 1977?

Count paid vacation, paid sick leave, and military service.

Weeks

c. During the weeks worked in 1977, how many hours did this person usually work each week?

Hours

33. Income in 1977 —

Fill circles and print dollar amounts.
If net income was a loss, write "Loss" above the dollar amount.
If exact amount is not known, give best estimate. For income received jointly by household members, see instruction sheet.

During 1977 did this person receive any income from the following sources?

If "Yes" to any of the sources below — How much did this person receive for the entire year?

a. Wages, salary, commissions, bonuses, or tips from all jobs . . .
Report amount before deductions for taxes, bonds, dues, or other items.

○ Yes → $ .00
○ No *(Dollars only)*

b. Own nonfarm business, partnership, or professional practice . . .
Report net income after business expenses.

○ Yes → $ .00
○ No *(Dollars only)*

c. Own farm . . .
Report net income after operating expenses. Include earnings as a tenant farmer or sharecropper.

○ Yes → $ .00
○ No *(Dollars only)*

d. Interest, dividends, royalties, or net rental income . . .
Report even small amounts credited to an account.

○ Yes → $ .00
○ No *(Dollars only)*

e. Social Security or Railroad Retirement . . .

○ Yes → $ .00
○ No *(Dollars only)*

f. Supplemental Security (SSI), Aid to Families with Dependent Children (AFDC), or other public assistance or public welfare payments . . .

○ Yes → $ .00
○ No *(Dollars only)*

g. Unemployment compensation, veterans' payments, pensions, alimony or child support, or any other sources of income received regularly . . .
Exclude lump-sum payments such as money from an inheritance or the sale of a home.

○ Yes → $ .00
○ No *(Dollars only)*

34. What was this person's total income in 1977?

$ .00
(Dollars only)
OR ○ None

Add entries in questions 33a through g; subtract any losses.
If total amount was a loss, write "Loss" above amount.

CENSUS USE ONLY

32b. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

32c. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Person number 1 2 3 4 5 6 ⊘

33a. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33b. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33c. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33d. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33e. ⊘ ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

33f. ⊘ ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

33g. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9

34. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

X. 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Y. 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Z. 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 8 8 9 9 9

9 8 7 6 5 4 ● 2 1

9 8 ● 6 5 4 3 2 1

ANSWER THESE QUESTIONS FOR

Name of Person 3 on page 2

Last name | First name | Middle initial

11. In what State or foreign country was this person born?

Print the State where this person's mother was living when this person was born. Do not give the location of the hospital unless the mother's home and the hospital were in the same State.

Be sure to name the State of birth, even if this person no longer lives in that State.

Name of State or foreign country; or Puerto Rico, Guam, etc.

12. *If this person was born in a foreign country –*

a. Is this person a naturalized citizen of the United States?

- ○ Yes, a naturalized citizen
- ○ No, not a citizen
- ○ Born abroad of American parents

b. When did this person come to the United States to stay?

- ○ 1975 to 1978
- ○ 1965 to 1969
- ○ 1950 to 1959
- ○ 1970 to 1974
- ○ 1960 to 1964
- ○ Before 1950

13. What is this person's ancestry?

If uncertain about how to report ancestry, see instruction sheet.

(For example – Afro-Amer., English, French, German, Honduran, Hungarian, Italian, Jamaican, Korean, Lebanese, Mexican, Nigerian, Polish, Ukrainian, Venezuelan, etc.)

14a. Does this person speak a language other than English at home?

- ○ Yes
- ○ No, only speaks English – *Skip to 15*

b. What is this language?

(For example – Chinese, Italian, Spanish, etc.)

c. Does this person speak this language at home more often than English?

- ○ Yes, more often than English
- ○ No, less often than English
- ○ Doesn't speak English

15. When did this person move into this house (or apartment)?

- ○ 1973 to 1978
- ○ 1960 to 1969
- ○ 1949 or earlier
- ○ 1970 to 1972
- ○ 1950 to 1959
- ○ Always lived here

16a. Did this person live in this house five years ago (April 1, 1973)? *If in college or Armed Forces in April 1973, report place of residence there.*

- ○ Born April 1973 or later – *Turn to next page for next person*
- ○ Yes, this house – *Skip to 17*
- ○ No, different house

b. Where did this person live five years ago (April 1, 1973)?

(1) State, foreign country, Puerto Rico, Guam, etc.: _____

(2) County: _____

(3) City, town, village, etc.: _____

(4) Inside the incorporated (legal) limits of that city, town, village, etc.?

- ○ Yes
- ○ No, in unincorporated area

17. When was this person born?

- ○ Born before April 1964 – *Please go on with questions 18–34*
- ○ Born April 1964 or later – *Turn to next page for next person.*

18. In April 1973 *(five years ago)* **was this person –**

a. On active duty in the Armed Forces?

- ○ Yes
- ○ No

b. Attending college?

- ○ Yes
- ○ No

c. Working at a job or business?

- ○ Yes, full time
- ○ Yes, part time
- ○ No

19a. Is this person a veteran of active-duty military service in the Armed Forces of the United States? *If service was in National Guard or Reserves only, see instruction sheet.*

- ○ Yes
- ○ No – *Skip to 20*

b. Was active duty military service during – *(Fill a circle for each period in which this person served.)*

- ○ May 1975 or later
- ○ Vietnam era *(August 1964–April 1975)*
- ○ February 1955–July 1964
- ○ Korean conflict *(June 1950–January 1955)*
- ○ World War II *(September 1940–July 1947)*
- ○ World War I *(April 1917–November 1918)*
- ○ Any other time

20. Does this person have a physical, mental, or other health condition which . . . *See instruction sheet for definition of health condition.*

	Yes	No
a. Limits the kind or amount of work this person can do at a job?	○	○
b. Prevents this person from working at a job?	○	○
c. Limits or prevents this person from using public transportation?	○	○

21. *If this person is a female –* **How many babies has she ever had, not counting stillbirths?** *Do not count her stepchildren or children she has adopted.*

None ○ | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 7 ○ | 8 ○ | 9 ○ | 10 ○ | 11 ○ | 12 or more ○

22. *If this person has ever been married –*

a. Has this person been married more than once?

- ○ Once
- ○ More than once

b. Month and year of marriage? _____ *(Month) (Year)*

Month and year of first marriage? _____ *(Month) (Year)*

c. *If married more than once* **– Did the first marriage end because of the death of the husband (or wife)?**

- ○ Yes
- ○ No

23a. Did this person work at any time last week?

- ○ Yes – *Fill this circle if this person worked full time or part time. (Count part-time work such as delivering papers, or helping without pay in a family business or farm. Also count active duty in the Armed Forces.)*
- ○ No – *Fill this circle if this person did not work, or did only own housework, school work, or volunteer work.*

Skip to 26

b. How many hours did this person work last week (at all jobs)? *Subtract any time off; add overtime or extra hours worked.*

_____ Hours

24. At what location did this person work last week? *If this person worked at more than one location, print where he or she worked most last week.*

If one location cannot be specified, see instruction sheet.

a. Address *(Number and street)* _____

If street address is not known, enter the building name, shopping center, or other physical location description.

b. Name of city, town, village, borough, etc.

c. Is the place of work inside the incorporated (legal) limits of that city, town, village, borough, etc.?

- ○ Yes
- ○ No, in unincorporated area

d. County _____

e. State _____ **f. ZIP Code** _____

25a. Last week, how long did it usually take this person to get from home to work (one way)?

_____ Minutes

b. How did this person usually get to work last week? *If this person used more than one method, give the one usually used for most of the distance.*

- ○ Car
- ○ Truck
- ○ Van
- ○ Bus or streetcar
- ○ Railroad
- ○ Subway or elevated
- ○ Taxicab
- ○ Walked only
- ○ Worked at home
- ○ Other – *Specify*

If car, truck, or van in 25b, go to 25c. Otherwise, skip to 29.

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11.	13.	W.	14b.	16b.	22b.	23b.	24.	VL
0 0 0	0 0 0	0	0 0 0	0 0 0 0 0 0	0 0	0 0	0 0 0	0 0 0
1 1 1	1 1 1	1	1 1 1	1 1 1 1 1 1	1 1	1 1	1 1 1 1 1 1	1 1 1
2 2 2	2 2 2	2	2 2 2	2 2 2 2 2 2	2 2	2 2	2 2 2 2 2 2	2 2 2
3 3 3	3 3 3	3	3 3 3	3 3 3 3 3 3	3 3	3 3	3 3 3 3 3 3	3 3 3
4 4 4	4 4 4	4	4 4 4	4 4 4 4 4 4	4 4	4 4	4 4 4 4 4 4	4 4 4
5 5 5	5 5 5	5	5 5 5	5 5 5 5 5 5	5 5	5 5	5 5 5 5 5 5	5 5 5
6 6 6	6 6 6	6	6 6 6	6 6 6 6 6 6	6 6	6 6	6 6 6 6 6 6	6 6 6
7 7 7	7 7 7	7	7 7 7	7 7 7 7 7 7	7 7	7 7	7 7 7 7 7 7	7 7 7
8 8 8	8 8 8	8	8 8 8	8 8 8 8 8 8	8 8	8 8	8 8 8 8 8 8	8 8 8
9 9 9	9 9 9	9	9 9 9	9 9 9 9 9 9	9 9	9 9	9 9 9 9 9 9	9 9 9

c. When going to work last week, did this person usually –

○ Drive alone – *Skip to 29* ○ Drive others only
○ Share driving ○ Ride as passenger only

d. How many people, including this person, usually rode to work in the car, truck, or van last week?

After answering 25d, skip to 29.

CENSUS USE
25a.
25d.

26. Was this person temporarily absent or on layoff from a job or business last week?

○ Yes, on layoff
○ Yes, on vacation, temporary illness, labor dispute, etc.
○ No

27a. Has this person been looking for work during the past 4 weeks?

○ Yes ○ No – *Skip to 28*

b. Could this person have taken a job last week?

○ No, already has a job
○ No, temporarily ill
○ No, other reasons *(in school, etc.)*
○ Yes, could have taken a job

28. When did this person last work, even for a few days?

○ 1978 ○ 1972 to 1975 ○ 1967 or earlier } *Skip*
○ 1977 ○ 1968 to 1971 ○ Never worked } *to 33*
○ 1976

29.
A B C
D E F
G H J
K L M
AF ○
NW ○

29–31. Current or most recent job activity

Describe clearly this person's chief job activity or business last week. If this person had more than one job, describe the one at which this person worked the most hours.

If this person had no job or business last week, give information for last job or business since 1968.

29. Industry

a. For whom did this person work? *If now on active duty in the Armed Forces, print "AF" and skip to question 32.*

(Name of company, business, organization, or other employer)

b. What kind of business or industry was this?

Describe activity at location where employed.

(For example: Junior high school, retail supermarket, dairy farm, TV and radio service, auto assembly plant, road construction)

c. Is this mainly – *(Fill one circle)*

○ Manufacturing ○ Retail trade
○ Wholesale trade ○ Other – *(agriculture, construction, service, government, etc.)*

30.
N P Q
R S T
U V W
X Y Z

30. Occupation

a. What kind of work was this person doing?

(For example: TV repair, sewing machine operator, spray painter, civil engineer, farm operator, farm work, junior high English teacher)

b. What were this person's most important activities or duties?

(For example: Types, keeps account books, files, sells cars, operates printing press, cleans buildings, finishes concrete)

31. Was this person – *(Fill one circle)*

Employee of private company, business, or individual, for wages, salary, or commissions ... ○
Federal government employee ... ○
State government employee ... ○
Local government employee *(city, county, etc.)* ... ○
Self-employed in own business, professional practice, or farm –
Own business not incorporated ... ○
Own business incorporated ... ○
Working without pay in family business or farm ... ○

32a. Last year (1977), did this person work, even for a few days, at a paid job or in a business or farm?

○ Yes ○ No – *Skip to 33*

b. How many weeks did this person work in 1977?

Count paid vacation, paid sick leave, and military service.

Weeks

c. During the weeks worked in 1977, how many hours did this person usually work each week?

Hours

33. Income in 1977 –

Fill circles and print dollar amounts.
If net income was a loss, write "Loss" above the dollar amount.
If exact amount is not known, give best estimate. For income received jointly by household members, see instruction sheet.

During 1977 did this person receive any income from the following sources?

If "Yes" to any of the sources below – How much did this person receive for the entire year?

a. Wages, salary, commissions, bonuses, or tips from all jobs ...

Report amount before deductions for taxes, bonds, dues, or other items.

○ Yes ○ No $ .00 *(Dollars only)*

b. Own nonfarm business, partnership, or professional practice ...

Report net income after business expenses.

○ Yes ○ No $ .00 *(Dollars only)*

c. Own farm ...

Report net income after operating expenses. Include earnings as a tenant farmer or sharecropper.

○ Yes ○ No $ .00 *(Dollars only)*

d. Interest, dividends, royalties, or net rental income ...

Report even small amounts credited to an account.

○ Yes ○ No $ .00 *(Dollars only)*

e. Social Security or Railroad Retirement ...

○ Yes ○ No $ .00 *(Dollars only)*

f. Supplemental Security (SSI), Aid to Families with Dependent Children (AFDC), or other public assistance or public welfare payments ...

○ Yes ○ No $ .00 *(Dollars only)*

g. Unemployment compensation, veterans' payments, pensions, alimony or child support, or any other sources of income received regularly ...

Exclude lump-sum payments such as money from an inheritance or the sale of a home.

○ Yes ○ No $ .00 *(Dollars only)*

34. What was this person's total income in 1977?

$ .00 *(Dollars only)*

OR ○ None

Add entries in questions 33a through g; subtract any losses.
If total amount was a loss, write "Loss" above amount.

CENSUS USE ONLY

32b. 32c. Person number

33a. 33b. 33c. 33d. 33e. 33f. 33g. 34.

X. Y. Z.

➡ Please turn to the next page and answer the questions for Person 4 on page 2.

ANSWER THESE QUESTIONS FOR

Name of Person 4 on page 2

Last name | First name | Middle initial

11. In what State or foreign country was this person born?

Print the State where this person's mother was living when this person was born. Do not give the location of the hospital unless the mother's home and the hospital were in the same State.

Be sure to name the State of birth, even if this person no longer lives in that State.

Name of State or foreign country; or Puerto Rico, Guam, etc.

12. *If this person was born in a foreign country –*

a. Is this person a naturalized citizen of the United States?

- ○ Yes, a naturalized citizen
- ○ No, not a citizen
- ○ Born abroad of American parents

b. When did this person come to the United States to stay?

- ○ 1975 to 1978
- ○ 1970 to 1974
- ○ 1965 to 1969
- ○ 1960 to 1964
- ○ 1950 to 1959
- ○ Before 1950

13. What is this person's ancestry?

If uncertain about how to report ancestry, see instruction sheet.

(For example – Afro-Amer., English, French, German, Honduran, Hungarian, Italian, Jamaican, Korean, Lebanese, Mexican, Nigerian, Polish, Ukrainian, Venezuelan, etc.)

14a. Does this person speak a language other than English at home?

- ○ Yes
- ○ No, only speaks English – *Skip to 15*

b. What is this language?

(For example – Chinese, Italian, Spanish, etc.)

c. Does this person speak this language at home more often than English?

- ○ Yes, more often than English
- ○ No, less often than English
- ○ Doesn't speak English

15. When did this person move into this house (or apartment)?

- ○ 1973 to 1978
- ○ 1970 to 1972
- ○ 1960 to 1969
- ○ 1950 to 1959
- ○ 1949 or earlier
- ○ Always lived here

16a. Did this person live in this house five years ago (April 1, 1973)? *If in college or Armed Forces in April 1973, report place of residence there.*

- ○ Born April 1973 or later – *Turn to next page for next person*
- ○ Yes, this house – *Skip to 17*
- ○ No, different house

b. Where did this person live five years ago (April 1, 1973)?

(1) State, foreign country, Puerto Rico, Guam, etc.: _____

(2) County: _____

(3) City, town, village, etc.: _____

(4) Inside the incorporated (legal) limits of that city, town, village, etc.?

- ○ Yes
- ○ No, in unincorporated area

17. When was this person born?

- ○ Born before April 1964 – *Please go on with questions 18–34*
- ○ Born April 1964 or later – *Turn to next page for next person.*

18. In April 1973 *(five years ago)* **was this person –**

a. On active duty in the Armed Forces?

- ○ Yes
- ○ No

b. Attending college?

- ○ Yes
- ○ No

c. Working at a job or business?

- ○ Yes, full time
- ○ Yes, part time
- ○ No

19a. Is this person a veteran of active-duty military service in the Armed Forces of the United States? *If service was in National Guard or Reserves only, see instruction sheet.*

- ○ Yes
- ○ No – *Skip to 20*

b. Was active duty military service during – *(Fill a circle for each period in which this person served.)*

- ○ May 1975 or later
- ○ Vietnam era *(August 1964–April 1975)*
- ○ February 1955–July 1964
- ○ Korean conflict *(June 1950–January 1955)*
- ○ World War II *(September 1940–July 1947)*
- ○ World War I *(April 1917–November 1918)*
- ○ Any other time

20. Does this person have a physical, mental, or other health condition which . . .

See instruction sheet for definition of health condition.

	Yes	No
a. Limits the kind or amount of work this person can do at a job?	○	○
b. Prevents this person from working at a job?	○	○
c. Limits or prevents this person from using public transportation?	○	○

21. *If this person is a female –*

How many babies has she ever had, not counting stillbirths?

Do not count her stepchildren or children she has adopted.

None ○ | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 7 ○ | 8 ○ | 9 ○ | 10 ○ | 11 ○ | 12 or more ○

22. *If this person has ever been married –*

a. Has this person been married more than once?

- ○ Once
- ○ More than once

b. Month and year of marriage? _____ *(Month)* _____ *(Year)*

Month and year of first marriage? _____ *(Month)* _____ *(Year)*

c. *If married more than once* **– Did the first marriage end because of the death of the husband (or wife)?**

- ○ Yes
- ○ No

23a. Did this person work at any time last week?

- ○ Yes – *Fill this circle if this person worked full time or part time. (Count part-time work such as delivering papers, or helping without pay in a family business or farm. Also count active duty in the Armed Forces.)*
- ○ No – *Fill this circle if this person did not work, or did only own housework, school work, or volunteer work.*

Skip to 26

b. How many hours did this person work last week (at all jobs)?

Subtract any time off; add overtime or extra hours worked.

Hours _____

24. At what location did this person work last week?

If this person worked at more than one location, print where he or she worked most last week.

If one location cannot be specified, see instruction sheet.

a. Address *(Number and street)* _____

If street address is not known, enter the building name, shopping center, or other physical location description.

b. Name of city, town, village, borough, etc.

c. Is the place of work inside the incorporated (legal) limits of that city, town, village, borough, etc.?

- ○ Yes
- ○ No, in unincorporated area

d. County _____

e. State _____ **f. ZIP Code** _____

25a. Last week, how long did it usually take this person to get from home to work (one way)?

Minutes _____

b. How did this person usually get to work last week?

If this person used more than one method, give the one usually used for most of the distance.

- ○ Car
- ○ Truck
- ○ Van
- ○ Bus or streetcar
- ○ Railroad
- ○ Subway or elevated
- ○ Taxicab
- ○ Walked only
- ○ Worked at home
- ○ Other – *Specify*

If car, truck, or van in 25b, go to 25c. Otherwise, skip to 29.

FOR CENSUS USE ONLY

11.	13.	W.		14b.	16b.	22b.	23b.	24.	VL
000 111 222 333 444 555 666 777 888 999	000 111 222 333 444 555 666 777 888 999	0 1 2 3 4 5 6 7 8 9		000 111 222 333 444 555 666 777 888 999	000 111 222 333 444 555 666 777 888 999	00 11 22 33 44 55 66 77 88 99	00 11 22 33 44 55 66 77 88 99	000 111 222 333 444 555 666 777 888 999	000 111 222 333 444 555 666 777 888 999

D-2(X)

c. When going to work last week, did this person usually —

○ Drive alone — *Skip to 29* ○ Drive others only
○ Share driving ○ Ride as passenger only

d. How many people, including this person, usually rode to work in the car, truck, or van last week?

After answering 25d, skip to 29.

26. Was this person temporarily absent or on layoff from a job or business last week?

○ Yes, on layoff
○ Yes, on vacation, temporary illness, labor dispute, etc.
○ No

27a. Has this person been looking for work during the past 4 weeks?

○ Yes ○ No — *Skip to 28*

b. Could this person have taken a job last week?

○ No, already has a job
○ No, temporarily ill
○ No, other reasons *(in school, etc.)*
○ Yes, could have taken a job

28. When did this person last work, even for a few days?

○ 1978 ○ 1972 to 1975 ○ 1967 or earlier ⎫ *Skip*
○ 1977 ○ 1968 to 1971 ○ Never worked ⎭ *to 33*
○ 1976

29–31. Current or most recent job activity

Describe clearly this person's chief job activity or business last week. If this person had more than one job, describe the one at which this person worked the most hours. If this person had no job or business last week, give information for last job or business since 1968.

29. Industry

a. For whom did this person work? *If now on active duty in the Armed Forces, print "AF" and skip to question 32.*

(Name of company, business, organization, or other employer)

b. What kind of business or industry was this?
Describe activity at location where employed.

(For example: Junior high school, retail supermarket, dairy farm, TV and radio service, auto assembly plant, road construction)

c. Is this mainly — *(Fill one circle)*

○ Manufacturing ○ Retail trade
○ Wholesale trade ○ Other — *(agriculture, construction, service, government, etc.)*

30. Occupation

a. What kind of work was this person doing?

(For example: TV repair, sewing machine operator, spray painter, civil engineer, farm operator, farm work, junior high English teacher)

b. What were this person's most important activities or duties?

(For example: Types, keeps account books, files, sells cars, operates printing press, cleans buildings, finishes concrete)

31. Was this person — *(Fill one circle)*

Employee of private company, business, or individual, for wages, salary, or commissions ... ○
Federal government employee ... ○
State government employee ... ○
Local government employee *(city, county, etc.)* ... ○
Self-employed in own business, professional practice, or farm —
Own business not incorporated ... ○
Own business incorporated ... ○
Working without pay in family business or farm ... ○

CENSUS USE

25a. 0 1 2 3 4 5 6 7 8 9

25d. 0 1 2 3 4 5 6 7 8 9

29. A B C D E F G H J K L M 0 1 2 3 4 5 6 7 8 9 AF NW

30. N P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9

32a. Last year (1977), did this person work, even for a few days, at a paid job or in a business or farm?

○ Yes ○ No — *Skip to 33*

b. How many weeks did this person work in 1977?
Count paid vacation, paid sick leave, and military service.

Weeks

c. During the weeks worked in 1977, how many hours did this person usually work each week?

Hours

33. Income in 1977 —

Fill circles and print dollar amounts.
If net income was a loss, write "Loss" above the dollar amount.
If exact amount is not known, give best estimate. For income received jointly by household members, see instruction sheet.

During 1977 did this person receive any income from the following sources?

If "Yes" to any of the sources below — How much did this person receive for the entire year?

a. Wages, salary, commissions, bonuses, or tips from all jobs ...
Report amount before deductions for taxes, bonds, dues, or other items.

○ Yes → $ .00 *(Dollars only)*
○ No

b. Own nonfarm business, partnership, or professional practice ...
Report net income after business expenses.

○ Yes → $ .00 *(Dollars only)*
○ No

c. Own farm ...
Report net income after operating expenses. Include earnings as a tenant farmer or sharecropper.

○ Yes → $ .00 *(Dollars only)*
○ No

d. Interest, dividends, royalties, or net rental income ...
Report even small amounts credited to an account.

○ Yes → $ .00 *(Dollars only)*
○ No

e. Social Security or Railroad Retirement ...

○ Yes → $ .00 *(Dollars only)*
○ No

f. Supplemental Security (SSI), Aid to Families with Dependent Children (AFDC), or other public assistance or public welfare payments ...

○ Yes → $ .00 *(Dollars only)*
○ No

g. Unemployment compensation, veterans' payments, pensions, alimony or child support, or any other sources of income received regularly ...
Exclude lump-sum payments such as money from an inheritance or the sale of a home.

○ Yes → $ .00 *(Dollars only)*
○ No

34. What was this person's total income in 1977?

$ .00 *(Dollars only)*

OR ○ None

Add entries in questions 33a through g; subtract any losses.
If total amount was a loss, write "Loss" above amount.

CENSUS USE ONLY

32b. 0 1 2 3 4 5 6 7 8 9

32c. 0 1 2 3 4 5 6 7 8 9

Person number 1 2 3 4 5 6 7 8 9 0

33a. 0 1 2 3 4 5 6 7 8 9 A O

33b. 0 1 2 3 4 5 6 7 8 9 A O

33c. 0 1 2 3 4 5 6 7 8 9 A O

33d. 0 1 2 3 4 5 6 7 8 9 A O

33e. 0 1 2 3 4 5 6 7 8 9

33f. 0 1 2 3 4 5 6 7 8 9 A O

33g. 0 1 2 3 4 5 6 7 8 9

34. 0 1 2 3 4 5 6 7 8 9 A O

X. 1 2 3 4 5 6 7 8 9

Y. 1 2 3 4 5 6 7 8 9

Z. 1 2 3 4 5 6 7 8 9

9 8 7 6 ● 4 3 2 1

9 8 ● 6 5 4 3 2 1

ANSWER THESE QUESTIONS FOR

Name of Person 5 on page 2

Last name _____ First name _____ Middle initial _____

11. In what State or foreign country was this person born?

Print the State where this person's mother was living when this person was born. Do not give the location of the hospital unless the mother's home and the hospital were in the same State.

Be sure to name the State of birth, even if this person no longer lives in that State.

_____

Name of State or foreign country; or Puerto Rico, Guam, etc.

12. *If this person was born in a foreign country –*

a. Is this person a naturalized citizen of the United States?

- ○ Yes, a naturalized citizen
- ○ No, not a citizen
- ○ Born abroad of American parents

b. When did this person come to the United States to stay?

- ○ 1975 to 1978
- ○ 1970 to 1974
- ○ 1965 to 1969
- ○ 1960 to 1964
- ○ 1950 to 1959
- ○ Before 1950

13. What is this person's ancestry?

If uncertain about how to report ancestry, see instruction sheet.

_____

(For example – Afro-Amer., English, French, German, Honduran, Hungarian, Italian, Jamaican, Korean, Lebanese, Mexican, Nigerian, Polish, Ukrainian, Venezuelan, etc.)

14a. Does this person speak a language other than English at home?

- ○ Yes
- ○ No, only speaks English – *Skip to 15*

b. What is this language?

_____

(For example – Chinese, Italian, Spanish, etc.)

c. Does this person speak this language at home more often than English?

- ○ Yes, more often than English
- ○ No, less often than English
- ○ Doesn't speak English

15. When did this person move into this house (or apartment)?

- ○ 1973 to 1978
- ○ 1970 to 1972
- ○ 1960 to 1969
- ○ 1950 to 1959
- ○ 1949 or earlier
- ○ Always lived here

16a. Did this person live in this house five years ago (April 1, 1973)? *If in college or Armed Forces in April 1973, report place of residence there.*

- ○ Born April 1973 or later – *Turn to next page for next person*
- ○ Yes, this house – *Skip to 17*
- ○ No, different house

b. Where did this person live five years ago (April 1, 1973)?

(1) State, foreign country, Puerto Rico, Guam, etc.: _____

(2) County: _____

(3) City, town, village, etc.: _____

(4) Inside the incorporated (legal) limits of that city, town, village, etc.?

- ○ Yes
- ○ No, in unincorporated area

17. When was this person born?

- ○ Born before April 1964 – *Please go on with questions 18–34*
- ○ Born April 1964 or later – *Turn to next page for next person.*

18. In April 1973 *(five years ago)* **was this person –**

a. On active duty in the Armed Forces?

- ○ Yes
- ○ No

b. Attending college?

- ○ Yes
- ○ No

c. Working at a job or business?

- ○ Yes, full time
- ○ Yes, part time
- ○ No

19a. Is this person a veteran of active-duty military service in the Armed Forces of the United States?

If service was in National Guard or Reserves only, see instruction sheet.

- ○ Yes
- ○ No – *Skip to 20*

b. Was active duty military service during –

(Fill a circle for each period in which this person served.)

- ○ May 1975 or later
- ○ Vietnam era *(August 1964–April 1975)*
- ○ February 1955–July 1964
- ○ Korean conflict *(June 1950–January 1955)*
- ○ World War II *(September 1940–July 1947)*
- ○ World War I *(April 1917–November 1918)*
- ○ Any other time

20. Does this person have a physical, mental, or other health condition which . . .

See instruction sheet for definition of health condition.

	Yes	No
a. Limits the kind or amount of work this person can do at a job?	○	○
b. Prevents this person from working at a job?	○	○
c. Limits or prevents this person from using public transportation?	○	○

21. *If this person is a female –*

How many babies has she ever had, not counting stillbirths?

Do not count her stepchildren or children she has adopted.

None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 or more ○

22. *If this person has ever been married –*

a. Has this person been married more than once?

- ○ Once
- ○ More than once

b. Month and year of marriage? _____ *(Month) (Year)*

Month and year of first marriage? _____ *(Month) (Year)*

c. *If married more than once* **– Did the first marriage end because of the death of the husband (or wife)?**

- ○ Yes
- ○ No

23a. Did this person work at any time last week?

- ○ Yes – *Fill this circle if this person worked full time or part time. (Count part-time work such as delivering papers, or helping without pay in a family business or farm. Also count active duty in the Armed Forces.)*
- ○ No – *Fill this circle if this person did not work, or did only own housework, school work, or volunteer work.*

Skip to 26

b. How many hours did this person work last week (at all jobs)?

Subtract any time off; add overtime or extra hours worked.

_____ Hours

24. At what location did this person work last week?

If this person worked at more than one location, print where he or she worked most last week.

If one location cannot be specified, see instruction sheet.

a. Address *(Number and street)* _____

If street address is not known, enter the building name, shopping center, or other physical location description.

b. Name of city, town, village, borough, etc.

_____

c. Is the place of work inside the incorporated (legal) limits of that city, town, village, borough, etc.?

- ○ Yes
- ○ No, in unincorporated area

d. County _____

e. State _____ **f. ZIP Code** _____

25a. Last week, how long did it usually take this person to get from home to work (one way)?

_____ Minutes

b. How did this person usually get to work last week?

If this person used more than one method, give the one usually used for most of the distance.

- ○ Car
- ○ Truck
- ○ Van
- ○ Bus or streetcar
- ○ Railroad
- ○ Subway or elevated
- ○ Taxicab
- ○ Walked only
- ○ Worked at home
- ○ Other – *Specify* _____

If car, truck, or van in 25b, go to 25c. Otherwise, skip to 29.

FOR CENSUS USE ONLY

11.	13.	W.	14b.	16b.	22b.	23b.	24.	VL
000 111 222 333 444 555 666 777 888 999	000 111 222 333 444 555 666 777 888 999	0 1 2 3 4 5 6 7 8 9	000 111 222 333 444 555 666 777 888 999	000 111 222 333 444 555 666 777 888 999	00 11 22 33 44 55 66 77 88 99	00 11 22 33 44 55 66 77 88 99	0000 1111 2222 3333 4444 5555 6666 7777 8888 9999	000 111 222 333 444 555 666 777 888 999

c. When going to work last week, did this person usually –

○ Drive alone – *Skip to 29* ○ Drive others only
○ Share driving ○ Ride as passenger only

d. How many people, including this person, usually rode to work in the car, truck, or van last week?

After answering 25d, skip to 29.

26. Was this person temporarily absent or on layoff from a job or business last week?

○ Yes, on layoff
○ Yes, on vacation, temporary illness, labor dispute, etc.
○ No

27a. Has this person been looking for work during the past 4 weeks?

○ Yes ○ No – *Skip to 28*

b. Could this person have taken a job last week?

○ No, already has a job
○ No, temporarily ill
○ No, other reasons *(in school, etc.)*
○ Yes, could have taken a job

28. When did this person last work, even for a few days?

○ 1978 ○ 1972 to 1975 ○ 1967 or earlier } *Skip*
○ 1977 ○ 1968 to 1971 ○ Never worked } *to 33*
○ 1976

29–31. Current or most recent job activity

Describe clearly this person's chief job activity or business last week. If this person had more than one job, describe the one at which this person worked the most hours.

If this person had no job or business last week, give information for last job or business since 1968.

29. Industry

a. For whom did this person work? *If now on active duty in the Armed Forces, print "AF" and skip to question 32.*

(Name of company, business, organization, or other employer)

b. What kind of business or industry was this?
Describe activity at location where employed.

(For example: Junior high school, retail supermarket, dairy farm, TV and radio service, auto assembly plant, road construction)

c. Is this mainly – *(Fill one circle)*

○ Manufacturing ○ Retail trade
○ Wholesale trade ○ Other – *(agriculture, construction, service, government, etc.)*

30. Occupation

a. What kind of work was this person doing?

(For example: TV repair, sewing machine operator, spray painter, civil engineer, farm operator, farm work, junior high English teacher)

b. What were this person's most important activities or duties?

(For example: Types, keeps account books, files, sells cars, operates printing press, cleans buildings, finishes concrete)

31. Was this person – *(Fill one circle)*

Employee of private company, business, or individual, for wages, salary, or commissions ... ○
Federal government employee ... ○
State government employee ... ○
Local government employee *(city, county, etc.)* ... ○
Self-employed in own business, professional practice, or farm –
Own business not incorporated ... ○
Own business incorporated ... ○
Working without pay in family business or farm ... ○

CENSUS USE

25a. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

25d. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

29. A B C ○ ○ ○ D E F ○ ○ ○ G H J ○ ○ ○ K L M ○ ○ ○ ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 AF ○ NW ○

30. N P Q ○ ○ ○ R S T ○ ○ ○ U V W ○ ○ ○ X Y Z ○ ○ ○ ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 8 8 9 9

32a. Last year (1977), did this person work, even for a few days, at a paid job or in a business or farm?

○ Yes ○ No – *Skip to 33*

b. How many weeks did this person work in 1977?
Count paid vacation, paid sick leave, and military service.

Weeks

c. During the weeks worked in 1977, how many hours did this person usually work each week?

Hours

33. Income in 1977 –

Fill circles and print dollar amounts.
If net income was a loss, write "Loss" above the dollar amount.
If exact amount is not known, give best estimate. For income received jointly by household members, see instruction sheet.

During 1977 did this person receive any income from the following sources?

If "Yes" to any of the sources below – How much did this person receive for the entire year?

a. Wages, salary, commissions, bonuses, or tips from all jobs ...
Report amount before deductions for taxes, bonds, dues, or other items.

○ Yes → $ .00 *(Dollars only)*
○ No

b. Own nonfarm business, partnership, or professional practice ...
Report net income after business expenses.

○ Yes → $ .00 *(Dollars only)*
○ No

c. Own farm ...
Report net income after operating expenses. Include earnings as a tenant farmer or sharecropper.

○ Yes → $ .00 *(Dollars only)*
○ No

d. Interest, dividends, royalties, or net rental income ...
Report even small amounts credited to an account.

○ Yes → $ .00 *(Dollars only)*
○ No

e. Social Security or Railroad Retirement ...

○ Yes → $ .00 *(Dollars only)*
○ No

f. Supplemental Security (SSI), Aid to Families with Dependent Children (AFDC), or other public assistance or public welfare payments ...

○ Yes → $ .00 *(Dollars only)*
○ No

g. Unemployment compensation, veterans' payments, pensions, alimony or child support, or any other sources of income received regularly ...
Exclude lump-sum payments such as money from an inheritance or the sale of a home.

○ Yes → $ .00 *(Dollars only)*
○ No

34. What was this person's total income in 1977?

$ .00 *(Dollars only)*

OR ○ None

Add entries in questions 33a through g; subtract any losses.
If total amount was a loss, write "Loss" above amount.

CENSUS USE ONLY

32b. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 9

32c. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 9

Person number 1 2 3 4 5 6 7 ⊘

33a. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33b. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33c. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33d. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33e. ⊘ ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

33f. ⊘ ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

33g. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9

34. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

X. 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Y. 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Z. 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

ANSWER THESE QUESTIONS FOR

Name of Person 6 on page 2

Last name | First name | Middle initial

11. In what State or foreign country was this person born?

Print the State where this person's mother was living when this person was born. Do not give the location of the hospital unless the mother's home and the hospital were in the same State.

Be sure to name the State of birth, even if this person no longer lives in that State.

Name of State or foreign country; or Puerto Rico, Guam, etc.

12. *If this person was born in a foreign country –*

a. Is this person a naturalized citizen of the United States?

- ○ Yes, a naturalized citizen
- ○ No, not a citizen
- ○ Born abroad of American parents

b. When did this person come to the United States to stay?

- ○ 1975 to 1978
- ○ 1970 to 1974
- ○ 1965 to 1969
- ○ 1960 to 1964
- ○ 1950 to 1959
- ○ Before 1950

13. What is this person's ancestry?

If uncertain about how to report ancestry, see instruction sheet.

(For example – Afro-Amer., English, French, German, Honduran, Hungarian, Italian, Jamaican, Korean, Lebanese, Mexican, Nigerian, Polish, Ukrainian, Venezuelan, etc.)

14a. Does this person speak a language other than English at home?

- ○ Yes
- ○ No, only speaks English – *Skip to 15*

b. What is this language?

(For example – Chinese, Italian, Spanish, etc.)

c. Does this person speak this language at home more often than English?

- ○ Yes, more often than English
- ○ No, less often than English
- ○ Doesn't speak English

15. When did this person move into this house (or apartment)?

- ○ 1973 to 1978
- ○ 1970 to 1972
- ○ 1960 to 1969
- ○ 1950 to 1959
- ○ 1949 or earlier
- ○ Always lived here

16a. Did this person live in this house five years ago (April 1, 1973)? *If in college or Armed Forces in April 1973, report place of residence there.*

- ○ Born April 1973 or later – *Turn to next page for next person*
- ○ Yes, this house – *Skip to 17*
- ○ No, different house

b. Where did this person live five years ago (April 1, 1973)?

(1) State, foreign country, Puerto Rico, Guam, etc.: _____

(2) County: _____

(3) City, town, village, etc.: _____

(4) Inside the incorporated (legal) limits of that city, town, village, etc.?

- ○ Yes
- ○ No, in unincorporated area

17. When was this person born?

- ○ Born before April 1964 – *Please go on with questions 18–34*
- ○ Born April 1964 or later – *Turn to next page for next person.*

18. In April 1973 *(five years ago)* **was this person –**

a. On active duty in the Armed Forces?

- ○ Yes
- ○ No

b. Attending college?

- ○ Yes
- ○ No

c. Working at a job or business?

- ○ Yes, full time
- ○ Yes, part time
- ○ No

19a. Is this person a veteran of active-duty military service in the Armed Forces of the United States? *If service was in National Guard or Reserves only, see instruction sheet.*

- ○ Yes
- ○ No – *Skip to 20*

b. Was active duty military service during – *(Fill a circle for each period in which this person served.)*

- ○ May 1975 or later
- ○ Vietnam era *(August 1964–April 1975)*
- ○ February 1955–July 1964
- ○ Korean conflict *(June 1950–January 1955)*
- ○ World War II *(September 1940–July 1947)*
- ○ World War I *(April 1917–November 1918)*
- ○ Any other time

20. Does this person have a physical, mental, or other health condition which . . .

See instruction sheet for definition of health condition.

	Yes	No
a. Limits the kind or amount of work this person can do at a job?	○	○
b. Prevents this person from working at a job?	○	○
c. Limits or prevents this person from using public transportation?	○	○

21. *If this person is a female –* **How many babies has she ever had, not counting stillbirths?**

Do not count her stepchildren or children she has adopted.

None ○ | 1 ○ | 2 ○ | 3 ○ | 4 ○ | 5 ○ | 6 ○ | 7 ○ | 8 ○ | 9 ○ | 10 ○ | 11 ○ | 12 or more ○

22. *If this person has ever been married –*

a. Has this person been married more than once?

- ○ Once
- ○ More than once

b. Month and year of marriage? _____ *(Month)* _____ *(Year)*

Month and year of first marriage? _____ *(Month)* _____ *(Year)*

c. *If married more than once* **– Did the first marriage end because of the death of the husband (or wife)?**

- ○ Yes
- ○ No

23a. Did this person work at any time last week?

- ○ Yes – *Fill this circle if this person worked full time or part time. (Count part-time work such as delivering papers, or helping without pay in a family business or farm. Also count active duty in the Armed Forces.)*
- ○ No – *Fill this circle if this person did not work, or did only own housework, school work, or volunteer work.*

Skip to 26

b. How many hours did this person work last week (at all jobs)?

Subtract any time off; add overtime or extra hours worked.

Hours _____

24. At what location did this person work last week?

If this person worked at more than one location, print where he or she worked most last week.

If one location cannot be specified, see instruction sheet.

a. Address *(Number and street)* _____

If street address is not known, enter the building name, shopping center, or other physical location description.

b. Name of city, town, village, borough, etc.

c. Is the place of work inside the incorporated (legal) limits of that city, town, village, borough, etc.?

- ○ Yes
- ○ No, in unincorporated area

d. County _____

e. State _____ **f. ZIP Code** _____

25a. Last week, how long did it usually take this person to get from home to work (one way)?

Minutes _____

b. How did this person usually get to work last week?

If this person used more than one method, give the one usually used for most of the distance.

- ○ Car
- ○ Truck
- ○ Van
- ○ Bus or streetcar
- ○ Railroad
- ○ Subway or elevated
- ○ Taxicab
- ○ Walked only
- ○ Worked at home
- ○ Other – *Specify*

If car, truck, or van in 25b, go to 25c. Otherwise, skip to 29.

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11.	13.	W.	14b.	16b.	22b.	23b.	24.	○ VL
⊘ ⊘ ⊘	⊘ ⊘ ⊘	⊘	⊘ ⊘ ⊘	⊘ ⊘ ⊘ ⊘ ⊘ ⊘	⊘ ⊘	⊘ ⊘	⊘ ⊘ ⊘ ⊘ ⊘ ⊘	⊘ ⊘ ⊘
1 1 1	1 1 1	1	1 1 1	1 1 1 1 1 1	1 1	1 1	1 1 1 1 1 1	1 1 1
2 2 2	2 2 2	2	2 2 2	2 2 2 2 2 2	2 2	2 2	2 2 2 2 2 2	2 2 2
3 3 3	3 3 3	3	3 3 3	3 3 3 3 3 3	3 3	3 3	3 3 3 3 3 3	3 3 3
4 4 4	4 4 4	4	4 4 4	4 4 4 4 4 4	4 4	4 4	4 4 4 4 4 4	4 4 4
5 5 5	5 5 5	5	5 5 5	5 5 5 5 5 5	5 5	5 5	5 5 5 5 5 5	5 5 5
6 6 6	6 6 6	6	6 6 6	6 6 6 6 6 6	6 6	6 6	6 6 6 6 6 6	6 6 6
7 7 7	7 7 7	7	7 7 7	7 7 7 7 7 7	7 7	7 7	7 7 7 7 7 7	7 7 7
8 8 8	8 8 8	8	8 8 8	8 8 8 8 8 8	8 8	8 8	8 8 8 8 8 8	8 8 8
9 9 9	9 9 9	9	9 9 9	9 9 9 9 9 9	9 9	9 9	9 9 9 9 9 9	9 9 9

c. When going to work last week, did this person usually –

○ Drive alone – *Skip to 29* ○ Drive others only
○ Share driving ○ Ride as passenger only

d. How many people, including this person, usually rode to work in the car, truck, or van last week?

After answering 25d, skip to 29.

26. Was this person temporarily absent or on layoff from a job or business last week?

○ Yes, on layoff
○ Yes, on vacation, temporary illness, labor dispute, etc.
○ No

27a. Has this person been looking for work during the past 4 weeks?

○ Yes ○ No – *Skip to 28*

b. Could this person have taken a job last week?

○ No, already has a job
○ No, temporarily ill
○ No, other reasons *(in school, etc.)*
○ Yes, could have taken a job

28. When did this person last work, even for a few days?

○ 1978 ○ 1972 to 1975 ○ 1967 or earlier
○ 1977 ○ 1968 to 1971 ○ Never worked *Skip to 33*
○ 1976

29–31. Current or most recent job activity

Describe clearly this person's chief job activity or business last week.
If this person had more than one job, describe the one at which this person worked the most hours.
If this person had no job or business last week, give information for last job or business since 1968.

29. Industry

a. For whom did this person work? *If now on active duty in the Armed Forces, print "AF" and skip to question 32.*

(Name of company, business, organization, or other employer)

b. What kind of business or industry was this?
Describe activity at location where employed.

(For example: Junior high school, retail supermarket, dairy farm, TV and radio service, auto assembly plant, road construction)

c. Is this mainly – *(Fill one circle)*

○ Manufacturing ○ Retail trade
○ Wholesale trade ○ Other – *(agriculture, construction, service, government, etc.)*

30. Occupation

a. What kind of work was this person doing?

(For example: TV repair, sewing machine operator, spray painter, civil engineer, farm operator, farm work, junior high English teacher)

b. What were this person's most important activities or duties?

(For example: Types, keeps account books, files, sells cars, operates printing press, cleans buildings, finishes concrete)

31. Was this person – *(Fill one circle)*

Employee of private company, business, or individual, for wages, salary, or commissions ... ○
Federal government employee ... ○
State government employee ... ○
Local government employee *(city, county, etc.)* ... ○
Self-employed in own business, professional practice, or farm –
Own business not incorporated ... ○
Own business incorporated ... ○
Working without pay in family business or farm ... ○

CENSUS USE

25a. ∅ 1 2 3 4 5 6 7 8 9

25d. ∅ 1 2 3 4 5 6 7 8 9

29. A B C ○ ○ ○ D E F ○ ○ ○ G H J ○ ○ ○ K L M ○ ○ ○ ∅ 1 2 3 4 5 6 7 8 9 AF ○ NW ○

30. N P Q ○ ○ ○ R S T ○ ○ ○ U V W ○ ○ ○ X Y Z ○ ○ ○ ∅ 1 2 3 4 5 6 7 8 9

32a. Last year (1977), did this person work, even for a few days, at a paid job or in a business or farm?

○ Yes ○ No – *Skip to 33*

b. How many weeks did this person work in 1977?
Count paid vacation, paid sick leave, and military service.

Weeks

c. During the weeks worked in 1977, how many hours did this person usually work each week?

Hours

33. Income in 1977 –

Fill circles and print dollar amounts.
If net income was a loss, write "Loss" above the dollar amount.
If exact amount is not known, give best estimate. For income received jointly by household members, see instruction sheet.

During 1977 did this person receive any income from the following sources?

If "Yes" to any of the sources below – How much did this person receive for the entire year?

a. Wages, salary, commissions, bonuses, or tips from all jobs ...
Report amount before deductions for taxes, bonds, dues, or other items.

○ Yes ○ No $ .00 *(Dollars only)*

b. Own nonfarm business, partnership, or professional practice ...
Report net income after business expenses.

○ Yes ○ No $ .00 *(Dollars only)*

c. Own farm ...
Report net income after operating expenses. Include earnings as a tenant farmer or sharecropper.

○ Yes ○ No $ .00 *(Dollars only)*

d. Interest, dividends, royalties, or net rental income ...
Report even small amounts credited to an account.

○ Yes ○ No $ .00 *(Dollars only)*

e. Social Security or Railroad Retirement ...

○ Yes ○ No $ .00 *(Dollars only)*

f. Supplemental Security (SSI), Aid to Families with Dependent Children (AFDC), or other public assistance or public welfare payments ...

○ Yes ○ No $ .00 *(Dollars only)*

g. Unemployment compensation, veterans' payments, pensions, alimony or child support, or any other sources of income received regularly ...
Exclude lump-sum payments such as money from an inheritance or the sale of a home.

○ Yes ○ No $ .00 *(Dollars only)*

34. What was this person's total income in 1977?

$ .00 *(Dollars only)*

OR ○ None

Add entries in questions 33a through g; subtract any losses.
If total amount was a loss, write "Loss" above amount.

CENSUS USE ONLY

32b. ∅ 1 2 3 4 5 6 7 8 9

32c. ∅ 1 2 3 4 5 6 7 8 9

Person number ∅ 1 2 3 4 5 6 7 8 9

33a. ∅ 1 2 3 4 5 6 7 8 9 A ○

33b. ∅ 1 2 3 4 5 6 7 8 9 A ○

33c. ∅ 1 2 3 4 5 6 7 8 9 A ○

33d. ∅ 1 2 3 4 5 6 7 8 9 A ○

33e. ∅ 1 2 3 4 5 6 7 8 9

33f. ∅ 1 2 3 4 5 6 7 8 9

33g. ∅ 1 2 3 4 5 6 7 8 9

34. ∅ 1 2 3 4 5 6 7 8 9 A ○

X. 1 2 3 4 5 6 7 8 9

Y. 1 2 3 4 5 6 7 8 9

Z. 1 2 3 4 5 6 7 8 9

ANSWER THESE QUESTIONS FOR

Name of Person 7 on page 3

Last name | First name | Middle initial

11. In what State or foreign country was this person born?

Print the State where this person's mother was living when this person was born. Do not give the location of the hospital unless the mother's home and the hospital were in the same State.

Be sure to name the State of birth, even if this person no longer lives in that State.

Name of State or foreign country; or Puerto Rico, Guam, etc.

12. *If this person was born in a foreign country –*

a. Is this person a naturalized citizen of the United States?

- ○ Yes, a naturalized citizen
- ○ No, not a citizen
- ○ Born abroad of American parents

b. When did this person come to the United States to stay?

- ○ 1975 to 1978
- ○ 1965 to 1969
- ○ 1950 to 1959
- ○ 1970 to 1974
- ○ 1960 to 1964
- ○ Before 1950

13. What is this person's ancestry?

If uncertain about how to report ancestry, see instruction sheet.

(For example – Afro-Amer., English, French, German, Honduran, Hungarian, Italian, Jamaican, Korean, Lebanese, Mexican, Nigerian, Polish, Ukrainian, Venezuelan, etc.)

14a. Does this person speak a language other than English at home?

- ○ Yes
- ○ No, only speaks English – *Skip to 15*

b. What is this language?

(For example – Chinese, Italian, Spanish, etc.)

c. Does this person speak this language at home more often than English?

- ○ Yes, more often than English
- ○ No, less often than English
- ○ Doesn't speak English

15. When did this person move into this house (or apartment)?

- ○ 1973 to 1978
- ○ 1960 to 1969
- ○ 1949 or earlier
- ○ 1970 to 1972
- ○ 1950 to 1959
- ○ Always lived here

16a. Did this person live in this house five years ago (April 1, 1973)? *If in college or Armed Forces in April 1973, report place of residence there.*

- ○ Born April 1973 or later – *Turn to next page for next person*
- ○ Yes, this house – *Skip to 17*
- ○ No, different house

b. Where did this person live five years ago (April 1, 1973)?

(1) State, foreign country, Puerto Rico, Guam, etc.: _____

(2) County: _____

(3) City, town, village, etc.: _____

(4) Inside the incorporated (legal) limits of that city, town, village, etc.?

- ○ Yes
- ○ No, in unincorporated area

17. When was this person born?

- ○ Born before April 1964 – *Please go on with questions 18–34*
- ○ Born April 1964 or later – *Turn to next page for next person.*

18. In April 1973 *(five years ago)* **was this person –**

a. On active duty in the Armed Forces?

- ○ Yes
- ○ No

b. Attending college?

- ○ Yes
- ○ No

c. Working at a job or business?

- ○ Yes, full time
- ○ Yes, part time
- ○ No

19a. Is this person a veteran of active-duty military service in the Armed Forces of the United States? *If service was in National Guard or Reserves only, see instruction sheet.*

- ○ Yes
- ○ No – *Skip to 20*

b. Was active duty military service during – *(Fill a circle for each period in which this person served.)*

- ○ May 1975 or later
- ○ Vietnam era *(August 1964–April 1975)*
- ○ February 1955–July 1964
- ○ Korean conflict *(June 1950–January 1955)*
- ○ World War II *(September 1940–July 1947)*
- ○ World War I *(April 1917–November 1918)*
- ○ Any other time

20. Does this person have a physical, mental, or other health condition which . . .

See instruction sheet for definition of health condition.

	Yes	No
a. Limits the kind or amount of work this person can do at a job?	○	○
b. Prevents this person from working at a job?	○	○
c. Limits or prevents this person from using public transportation?	○	○

21. *If this person is a female –* **How many babies has she ever had, not counting stillbirths?**

Do not count her stepchildren or children she has adopted.

None ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 or more ○

22. *If this person has ever been married –*

a. Has this person been married more than once?

- ○ Once
- ○ More than once

b. Month and year of marriage? _____ *(Month) (Year)*

Month and year of first marriage? _____ *(Month) (Year)*

c. *If married more than once* **– Did the first marriage end because of the death of the husband (or wife)?**

- ○ Yes
- ○ No

23a. Did this person work at any time last week?

- ○ Yes – *Fill this circle if this person worked full time or part time. (Count part-time work such as delivering papers, or helping without pay in a family business or farm. Also count active duty in the Armed Forces.)*
- ○ No – *Fill this circle if this person did not work, or did only own housework, school work, or volunteer work.*

Skip to 26

b. How many hours did this person work last week (at all jobs)?

Subtract any time off; add overtime or extra hours worked.

_____ Hours

24. At what location did this person work last week?

If this person worked at more than one location, print where he or she worked most last week.

If one location cannot be specified, see instruction sheet.

a. Address *(Number and street)* _____

If street address is not known, enter the building name, shopping center, or other physical location description.

b. Name of city, town, village, borough, etc.

c. Is the place of work inside the incorporated (legal) limits of that city, town, village, borough, etc.?

- ○ Yes
- ○ No, in unincorporated area

d. County _____

e. State _____ **f. ZIP Code** _____

25a. Last week, how long did it usually take this person to get from home to work (one way)?

_____ Minutes

b. How did this person usually get to work last week?

If this person used more than one method, give the one usually used for most of the distance.

- ○ Car
- ○ Truck
- ○ Van
- ○ Bus or streetcar
- ○ Railroad
- ○ Subway or elevated
- ○ Taxicab
- ○ Walked only
- ○ Worked at home
- ○ Other – *Specify*

If car, truck, or van in 25b, go to 25c. Otherwise, skip to 29.

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11.	13.	W.	14b.	16b.	22b.	23b.	24.	VL
000 111 222 333 444 555 666 777 888 999	000 111 222 333 444 555 666 777 888 999	0 1 2 3 4 5 6 7 8 9	000 111 222 333 444 555 666 777 888 999	000 111 222 333 444 555 666 777 888 999	00 11 22 33 44 55 66 77 88 99	00 11 22 33 44 55 66 77 88 99	000 111 222 333 444 555 666 777 888 999	000 111 222 333 444 555 666 777 888 999

c. When going to work last week, did this person usually —

○ Drive alone — *Skip to 29* ○ Drive others only
○ Share driving ○ Ride as passenger only

d. How many people, including this person, usually rode to work in the car, truck, or van last week?

After answering 25d, skip to 29.

26. Was this person temporarily absent or on layoff from a job or business last week?

○ Yes, on layoff
○ Yes, on vacation, temporary illness, labor dispute, etc.
○ No

27a. Has this person been looking for work during the past 4 weeks?

○ Yes ○ No — *Skip to 28*

b. Could this person have taken a job last week?

○ No, already has a job
○ No, temporarily ill
○ No, other reasons *(in school, etc.)*
○ Yes, could have taken a job

28. When did this person last work, even for a few days?

○ 1978 ○ 1972 to 1975 ○ 1967 or earlier } *Skip*
○ 1977 ○ 1968 to 1971 ○ Never worked } *to 33*
○ 1976

29–31. Current or most recent job activity

Describe clearly this person's chief job activity or business last week.
If this person had more than one job, describe the one at which this person worked the most hours.
If this person had no job or business last week, give information for last job or business since 1968.

29. Industry

a. For whom did this person work? *If now on active duty in the Armed Forces, print "AF" and skip to question 32.*

(Name of company, business, organization, or other employer)

b. What kind of business or industry was this?
Describe activity at location where employed.

(For example: Junior high school, retail supermarket, dairy farm, TV and radio service, auto assembly plant, road construction)

c. Is this mainly — *(Fill one circle)*

○ Manufacturing ○ Retail trade
○ Wholesale trade ○ Other — *(agriculture, construction, service, government, etc.)*

30. Occupation

a. What kind of work was this person doing?

(For example: TV repair, sewing machine operator, spray painter, civil engineer, farm operator, farm work, junior high English teacher)

b. What were this person's most important activities or duties?

(For example: Types, keeps account books, files, sells cars, operates printing press, cleans buildings, finishes concrete)

31. Was this person — *(Fill one circle)*

Employee of private company, business, or individual, for wages, salary, or commissions ... ○
Federal government employee ... ○
State government employee ... ○
Local government employee *(city, county, etc.)* ... ○
Self-employed in own business, professional practice, or farm —
Own business not incorporated ... ○
Own business incorporated ... ○
Working without pay in family business or farm ... ○

CENSUS USE

25a. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

25d. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

29. A B C D E F G H J K L M ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 AF ○ NW ○

30. N P Q R S T U V W X Y Z ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 - 8 8 9 9

32a. Last year (1977), did this person work, even for a few days, at a paid job or in a business or farm?

○ Yes ○ No — *Skip to 33*

b. How many weeks did this person work in 1977?
Count paid vacation, paid sick leave, and military service.

Weeks

c. During the weeks worked in 1977, how many hours did this person usually work each week?

Hours

33. Income in 1977 —

Fill circles and print dollar amounts.
If net income was a loss, write "Loss" above the dollar amount.
If exact amount is not known, give best estimate. For income received jointly by household members, see instruction sheet.

During 1977 did this person receive any income from the following sources?

If "Yes" to any of the sources below — How much did this person receive for the entire year?

a. Wages, salary, commissions, bonuses, or tips from all jobs ...
Report amount before deductions for taxes, bonds, dues, or other items.

○ Yes → $ .00
○ No *(Dollars only)*

b. Own nonfarm business, partnership, or professional practice ...
Report net income after business expenses.

○ Yes → $ .00
○ No *(Dollars only)*

c. Own farm ...
Report net income after operating expenses. Include earnings as a tenant farmer or sharecropper.

○ Yes → $ .00
○ No *(Dollars only)*

d. Interest, dividends, royalties, or net rental income ...
Report even small amounts credited to an account.

○ Yes → $ .00
○ No *(Dollars only)*

e. Social Security or Railroad Retirement ...

○ Yes → $ .00
○ No *(Dollars only)*

f. Supplemental Security (SSI), Aid to Families with Dependent Children (AFDC), or other public assistance or public welfare payments ...

○ Yes → $ .00
○ No *(Dollars only)*

g. Unemployment compensation, veterans' payments, pensions, alimony or child support, or any other sources of income received regularly ...
Exclude lump-sum payments such as money from an inheritance or the sale of a home.

○ Yes → $ .00
○ No *(Dollars only)*

34. What was this person's total income in 1977?

$ .00 *(Dollars only)*
OR ○ None

Add entries in questions 33a through g; subtract any losses.
If total amount was a loss, write "Loss" above amount.

CENSUS USE ONLY

32b. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6

32c. ⊘ ⊘ 1 1 2 2 3 3 4 4 5 5 6 7 8 9

Person number 1 2 3 4 5 6 7 ⊘

33a. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33b. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33c. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33d. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

33e. ⊘ ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

33f. ⊘ ⊘ ⊘ ⊘ 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

33g. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

34. ⊘ ⊘ ⊘ ⊘ 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5 6 6 6 6 7 7 7 7 8 8 8 8 9 9 9 9 A ○

X. 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Y. 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Z. 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8 9 9 9

9 ● 7 6 5 4 3 2 1

9 8 ● 6 5 4 3 2 1

2(X)

Please Make Sure You Have Filled This Form Completely

For persons who answered in Question 1 that they are staying here only temporarily and have a usual home elsewhere, enter the address of usual home here:

House number Street or road Apartment number or location

City County

State ZIP Code

For Answers to Questions H1, H2, and H3:

H1. Name of person(s) left out and reason:

H2. Name of person(s) away from home and reason away:

H3. Name of visitor(s) for whom there is no one at the home address to report the person to a Census Taker:

NOTE

If you have listed more than 7 persons in Question 1, please make sure that you have filled the form for the first 7 people. Then mail back this form. A Census Taker will call to obtain the information for the other people.

1 Check to be certain you have:

- Answered Question 1 on page 1.
- Answered Questions 2 through 10 for each person you listed at the top of pages 2 and 3.
- Answered Questions H1 through H34 on pages 3, 4, and 5.
- Filled a pair of pages for each person listed on pages 2 and 3. That is, pages 6 and 7 should be filled for the Person in column 1; pages 8 and 9 for the Person in column 2, etc.

Please notice we need answers to questions 18 through 34 for every person born before April 1964 even though they may not seem to apply to the particular person.

For example, you may have forgotten to fill all the necessary circles on work or on income for a housewife, a teenager going to school, or an older retired person. To avoid our having to check with you to make sure of the answer, please be certain you have given all the necessary answers.

2 Write here the name of the person who filled the form, the date, and the telephone number on which the people in this household can be called.

Name

Date

Telephone Number

3 Then fold the form the way it was sent to you. Mail it back in the enclosed envelope. The address of the U.S. Census Office appears on the front cover of this questionnaire. Please be sure that before you seal the envelope the address shows through the window. No stamp is required.

Thank you very much .

☆ GPO : 1978 O - 252-692

PROJECT WORK PLAN SCHEDULE CONTINUED

PROJECT NO. 7005

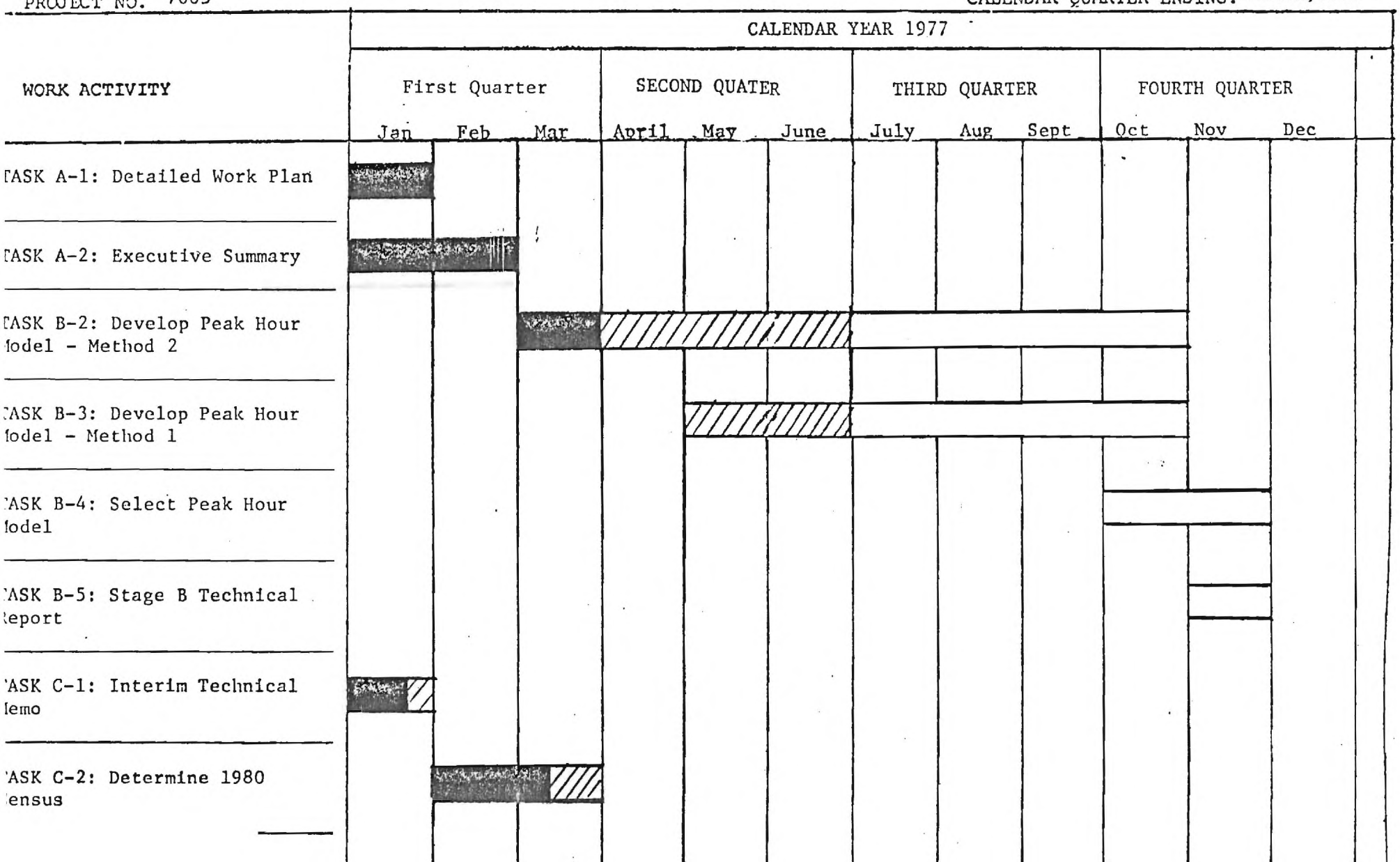
CALENDAR QUARTER ENDING: MARCH 1977

WORK ACTIVITY	CALENDAR YEAR 1977											
	FIRST QUARTER			SECOND QUARTER			THIRD QUARTER			FOURTH QUARTER		
	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
TASK C-3: Census Questionnaire Status												
TASK C-4: Prepare Transportation Questions 1980 Census												
TASK C-5: Stage C Technical Report												
Preparation, Review & Revision of Final Report												

PROJECT WORK PLAN SCHEDULE

PROJECT NO. 7005

CALENDAR QUARTER ENDING: MARCH, 1977



E-20-6C

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS AND RESEARCH
RESEARCH AND DEVELOPMENT BUREAU

RESEARCH QUARTERLY PROGRESS REPORT

Date of Repor

July 11, 1977

1 Project No. State/Agency	2 Project Title:	3 Quarterly Re
GDOT/GT 7005/E20-609	"Development of an Urban Peak Hour Model Based on the 1970 Census and Concurrent Ground Counts, Phase II"	No. 2 From April 1, 1 To June 30, 1977

4 Research Agency	5 Project Director(s)
Georgia Institute of Technology School of Civil Engineering	Dr. Donald O. Covault Professor of Civil Engineerin

6 Starting Date	7 Completion Date	8 % Time Expended	9 Schedule Status
December 13, 1976	February 22, 1978	46%	☐ Ahead ☒ On ☐ Behind

Funds Authorized		Funds Expended				
10 Total	11 Current Fiscal Year	12 Total to Date	%	13 Current Fiscal Year	%	14 Report Quarter
$37,568.00	$7,000.00	$5995.50	16.0	$5995.50	85.7	$3234.50

15 Sufficiency of Funds: ☒ Sufficient ☐ Insufficient

16 Progress this Quarter by Phase or Work Item (Reference to Work Plan Schedule, item 26, p. 6):

Task B2-A Prepare Work Trip Table-20% completed

Data has been obtained from GDOT regarding the Atlanta SMSA. The informati will be used with the FHWA Planpac and Backpac programs to prepare a work trip table.

Task B-2B Network Capacity Restraint Assignment - 20% completed.

Work is underway using Atlanta SMSA data and Planpac and Backpac to produce traffic loads on the present Atlanta network. These loads will be compared to t approximately 260 ground counts taken in 1972 (Phase 1 of this work).

Note: Both tasks B2-A & B2-B correspond to the research connected with Method 2 of the detailed work plan. Computer programs for this work are now in oper. tion on the IBM 370 at the University of Georgia Computer Center.

Task B3 Other Research Procedures-30% completed.

Investigation of procedures to build peak volumes from ADT volumes are now under investigation by Mr. Phillip Boyd of the staff on the Engineering Experiment Station. Mr. Boyd is performing this work as part of his academic work at Georgia Tech and is not being directly paid out of project funds.

Task C-1 Interim Report-100% completed.

Task C-2 Determine 1980 Census Status-100% completed.

16 (continued)

Task C-3 Census Questionnaire Criteria-100% completed.
All of the activities in Task C-2 and C-3 have been summarized and submi
in a report entitled, "Interim Report Status of the 1980 Census Instrument,
May, 1977. This report is presently under review.

Task C-4 Prepare Transportation Questions for Census-80% completed.
The finalization of this task is dependent upon the review of the repor
described in Task C-3.

(Continue on additional sheets as necessary)

17 Proposed Activity for Next Quarter:

Task B2-A Prepare Work Trip Table - to be completed.
Task B-2B Network Capacity Restraint Assignment - to be completed.
Task B-2C Peak Hour Model - to be 60% completed (See Task B3, item 16 of t
report).
Task B-4 Select Peak Hour Model - to be 50% completed.

(Continue on additional sheets as necessary)

18 Significant Technical Information, Recommendations, Implementation:

(a) Preparation and acceptance of acceptance of Executive Summary of Phase
of this work.
(b) Preparation of Interim Report on status of census questions for the 19
census instrument.
(c) Continuation of work with Census and FHWA on the 1980 census.

(Continue on additional sheets as necessary)

19 Estimated Funds Expended:

	During Quarter	During Fiscal Year	Total to Dat
Personnel	1774.75	3340.75	3340.7
Materials and Supplies	7.13	100.13	100.1
Services	24.95	24.95	24.9
Travel	161.31	161.34	161.3
Equipment			
Rental			
Purchase			
Overhead (68 %)	1206.83	2271.83	2271.8
Staff Benefits/Retirement (9.1 %)	59.53	96.53	96.5
Other _____			
_____			
Total	3234.50	5995.50	5995.50

20 Project Personnel Time:

Name	Title	% Time or No. Hc
Dr. Donald O. Covault	Professor of Civil Engineering	6.0%
Mr. John Moskaluk	Graduate Student in Civil Engineering	37.5%
Mr. Phillip Boyd	Assistant Research Engineer	5.0%

21 Project Modification(s) Required: ☒ No ☐ Yes

Reason: ☐ Scope Revision ☐ Fund Increase ☐ Time Extension ☐

Description of Modification(s):

22 Project Communications:

Significant Inspections and Correspondence:

None

Technical Meetings and Presentations:

(1) Progress Report presented to Semiannual Review Research Meeting of GDOT April, 1977

(2) Meeting with John Wilson of the Atlanta Regional Commission and GDOT concerning scope of work as outlined in Executive Summary, June 1977.

(3) "Urban Transportation Systems Symposium" in Washington, D.C. (3-day conference) June, 1977. This conference was sponsored by FHWA.

23 Reports

		Dates Due	
		Draft	Final
Work Program		NA	Feb. 15 each year
Interim			
Technical	Stage B State C		November, 1977
Special	Executive Summary		November, 1977
Final		January 13, 1978	March, 1977
Other	Detailed Work Plan		February, 1977

24 Problems:

☐ No

☒ Yes Nature: ☐ Personnel ☐ Technical ☐

Description of Problem:

Some difficulties have been experienced in making FHWA transportation planning computer programs work at the University of Georgia Computer Center. Most of these problems now seem to have been resolved.

25 Closing:

Report Prepared by:

Signature

Dr. D. O. Covault

Name

Professor of Civil Engineering

Title

Report Approved by:
(if required)

Signature

Dr. J. E. Fitzgerald

Name

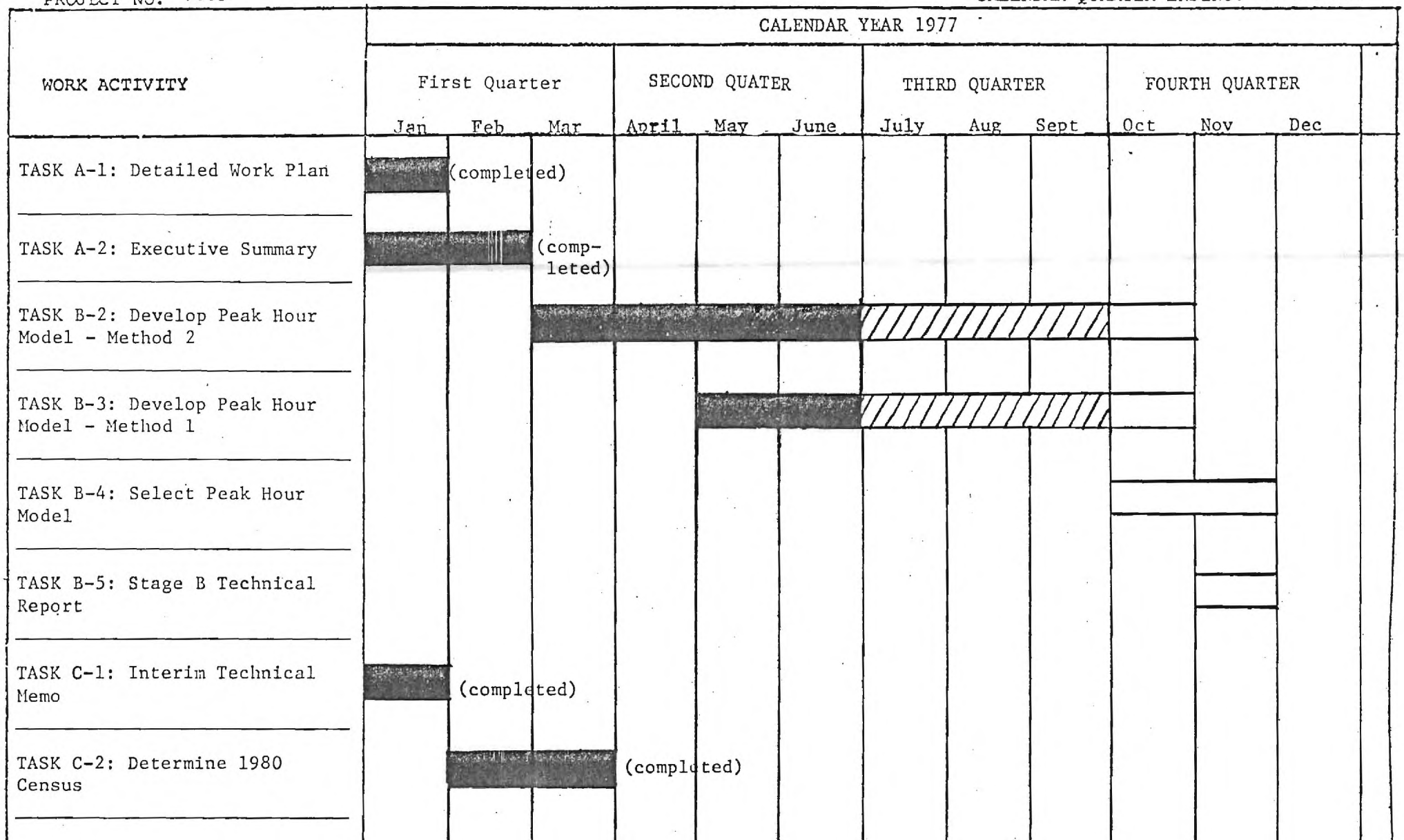
Director of Civil Engineering

Title

PROJECT WORK PLAN SCHEDULE

PROJECT NO. 7005

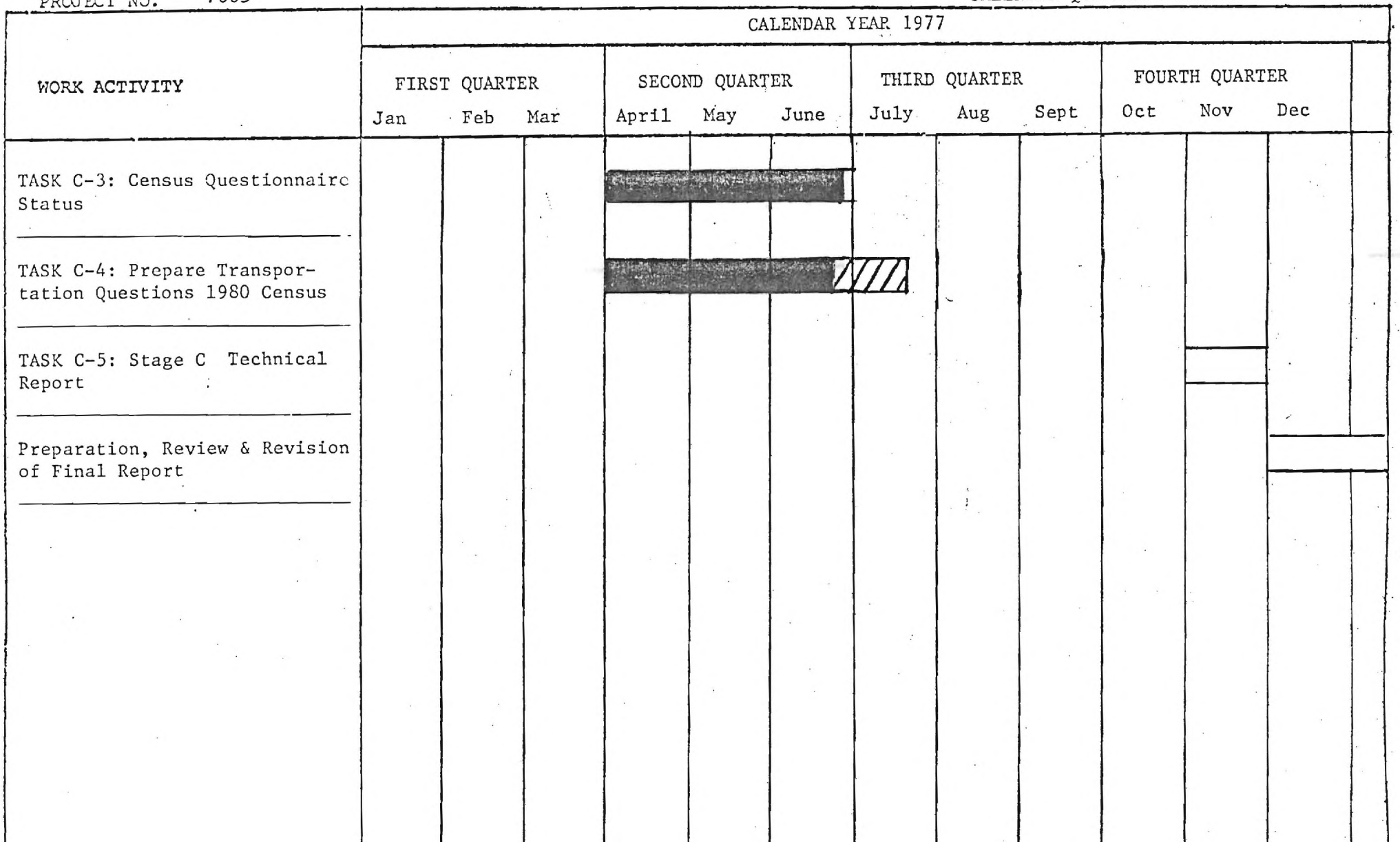
CALENDAR QUARTER ENDING: MARCH, 1977



PROJECT WORK PLAN SCHEDULE CONTINUED

PROJECT NO. 7005

CALENDAR QUARTER ENDING: MARCH 1977



E-20-609

RESEARCH QUARTERLY PROGRESS REPORT

GEORGIA DEPARTMENT OF TRANSPORTATION

Date of Report: October 10, 1977

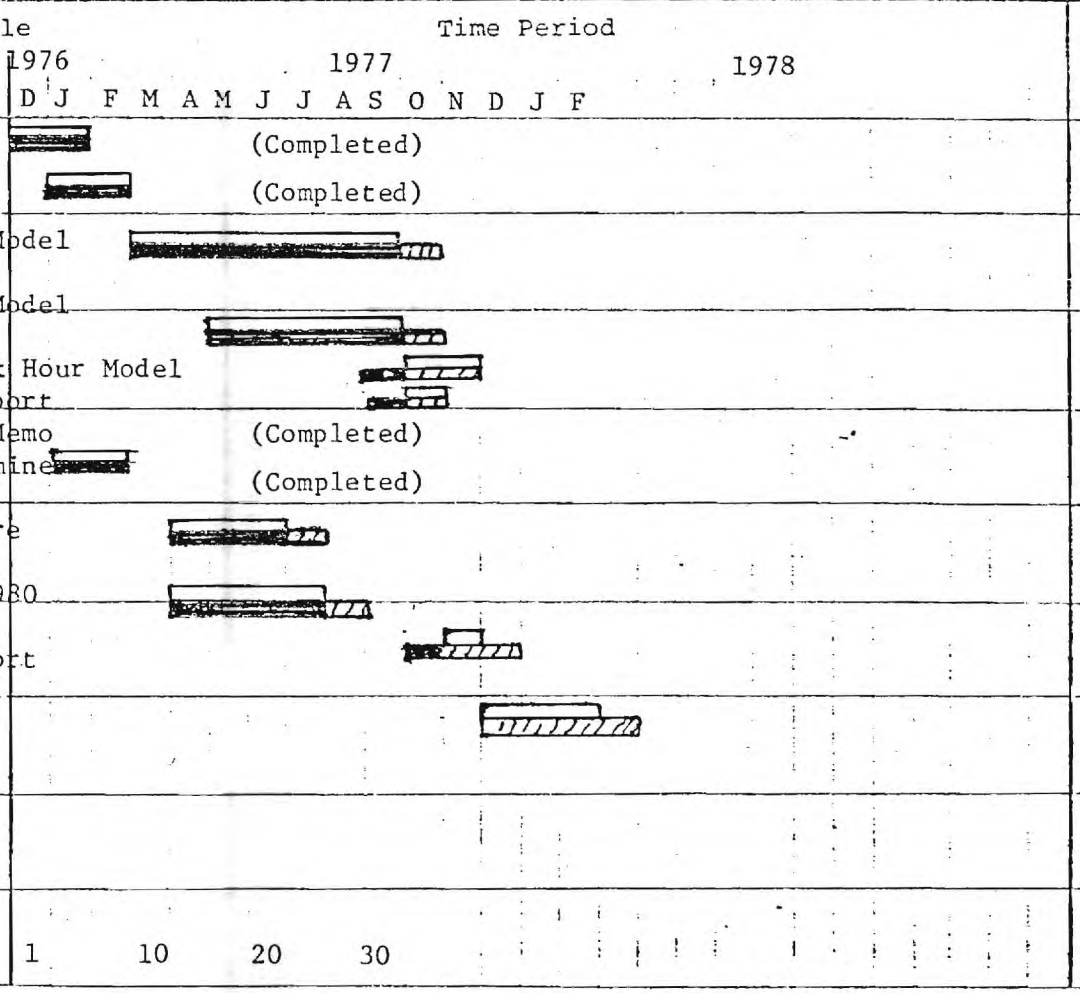
1 Project No. State/Agency	2 Project Title	3 Quarterly Rep No.
GDOT/GT 7005/ E20-609	Development of an Urban Peak Hour Traffic Model Based on 1970 Census and Concurrent Ground Counts, Phase II	3 From July 1, 19 To September, 30

4 Research Agency	5 Project Director(s)
Georgia Institute of Technology School of Civil Engineering	Dr. Donald O. Covault Professor

6 Starting Date	7 Completion Date	8 % Time Expended	9 Schedule Status	10 Sufficiency of
December 13, 1976	February 22, 1978	63	☐ Ahead ☒ Behind * ☐ On *(about 6 weeks)	☒ Sufficient ☐ Insufficient

Funds Authorized				Funds Expended		
11 Total	12 Current Fiscal Year	13 Total to Date	%	14 Current Fiscal Year	%	15 Report Quarter
37,568.00	31,572.50	14,315.58	38 %	8,230.08 ~~8320.08~~	26%	8,320.08

16 Project Schedule



Work Completed Schedule Projected Comple

E-20-6

RESEARCH QUARTERLY PROGRESS REPORT

GEORGIA DEPARTMENT OF TRANSPORTATION

Date of Report: January 25, 197

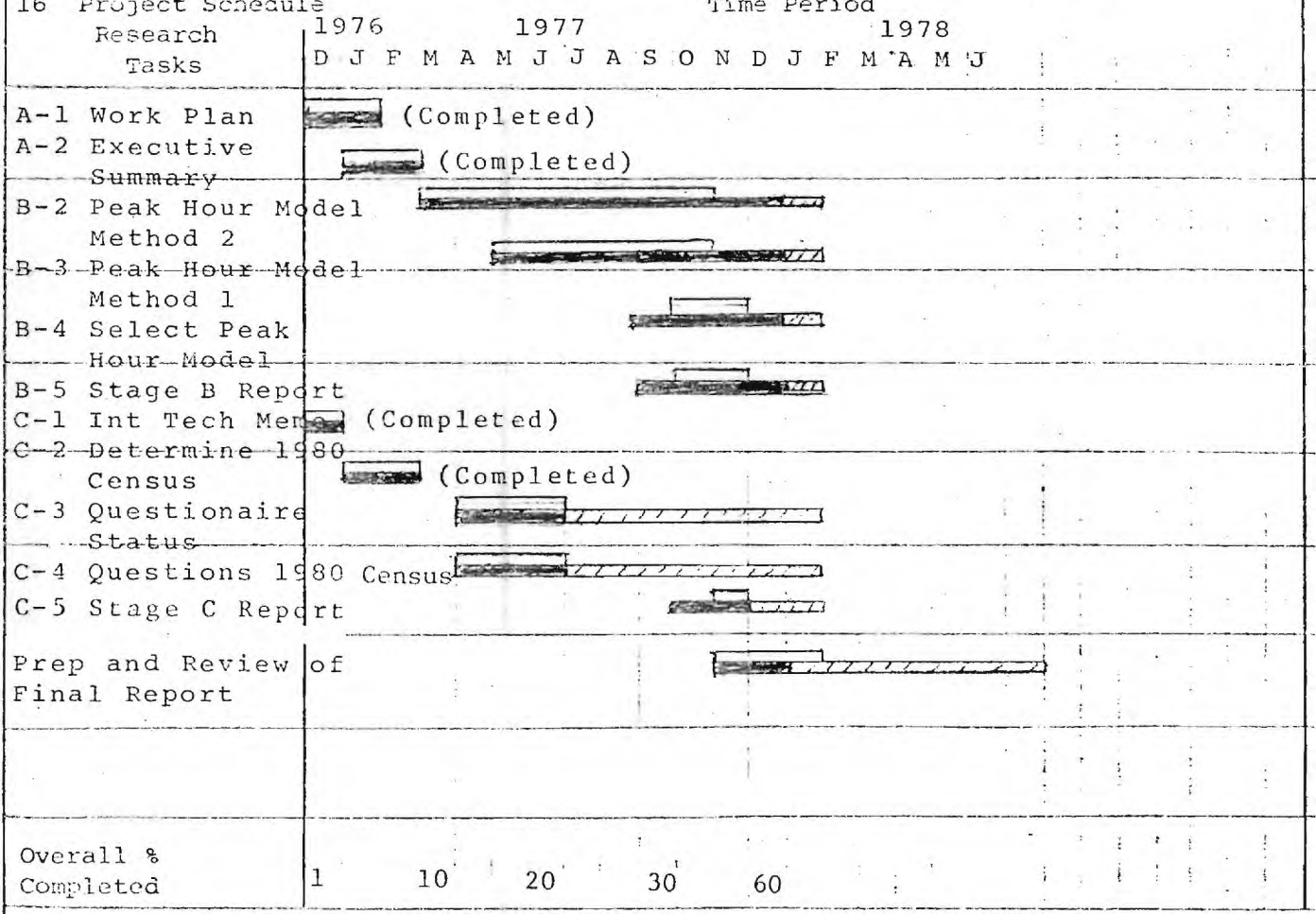
1 Project No. State/Agency	2 Project Title	3 Quarterly Report No. 4
GDOT/GT E-20-609	Development of an Urban Peak Hour Traffic Model Based upon the 1970 Census and Concurrent Ground Counts, Phase II	From Oct. 1, 19 To Dec. 30, 197

4 Research Agency	5 Project Director(s)
Georgia Institute of Technology School of Civil Engineering	Dr. Donald O. Covault Professor

6 Starting Date	7 Completion Date	8 % Time Expended	9 Schedule Status	10 Sufficiency of
Dec. 13, 1976	Feb. 22, 1978	83	☐ Ahead ☒ Behind * ☐ On *About 8 weeks	☒ Sufficient ☐ Insufficient

Funds Authorized		Funds Expended				
11 Total	12 Current Fiscal Year	13 Total to Date	%	14 Current Fiscal Year	%	15 Report Quarter
37,568.00	31,572.00	29,990.36	72	20,994.26	66	12,674.18

16 Project Schedule



E 20

TECHNICAL REPORT FOR STAGE C

STATUS OF TRANSPORTATION QUESTIONS ON THE 1980 U. S. CENSUS

Research Project GDOT/GT 7005/E20-609

"Development of an Urban Peak Hour Model Based on the 1980 Census and Concurrent Ground Counts, Phase II"

Project Director:

Donald O. Covault,
Professor of Civil Engineering

Graduate Research Assistant:
John Moskaluk

Georgia Institute of Technology
Atlanta, Georgia

March 20, 1978

Introduction

As outlined in the work plan for this research project, Stage C will consist of an evaluation of transportation related questions on the 1980 census, and the supplying of information to the Bureau of Census (BC) through the Georgia Department of Transportation (GDOT) and the Federal Highway Administratio (FHWA). In an attempt to provide information to GDOT and the FHWA, an interim report entitled "Status of the 1980 Census Instrument" was prepared and presented to these agencies in May 1977. Since this time, activities of the Bureau of Cens have been monitored in order to keep informed as to the status of transportation related questions on the 1980 Census. This report will cover information already discussed in the report of May 1977 and information gained since that time.

Pretests

Pretests of the 1980 Census Questionnaire were held in three cities in the United States, i.e., Travis County, (Austin) Texas; Camden, New Jersey; and Oakland, California. The purpose of these pretests was to evaluate the Census Questionnaire in regard to all of the possible problems which may result from the questions being used, interpreted by the respondent, and the coding of responses on the part of the Bureau of the Census. Several transportation questions related to the work trip were on the questionnaires used in each city (See May 1977 report for the specific questions used.). These pretests were invaluable to the Bureau of the Census in structuring the final questions which are now in the process of being printed. The sampling rate for the transportation work trip question was 15 percent; a 15-percent sampling rate was also used in the 1970 Census. The transportation-related questions were not precisely the same in each of the three pretests discussed above. The questions that were used were the questions suggested by consultation with members of the Federal Highway Administration and the Bureau of the Census. The major persons involved with this work are as follows:

Mr. Marshall L. Turner, Jr.
Assistant Chief Demographic Census Staff
Bureau of the Census
Washington, D. C. 20233
Phone (301) 763-7325

Mr. James McDonnell
Chief Planning Procedures Branch (HHP-24)
Federal Highway Administration
Washington, D. C. 20590
Phone (202) 426-0150

Mr. Constantine Ben HHP-24
Federal Highway Administration
Washington, D. C. 20590
Phone (202) 426-0150

One should note that the questions asked in the pretests on the work trip were more numerous and detailed than were asked in the 1970 Census.

May 1977 Report

One of the major concerns of the report to GDOT in May 1977 was an evaluation of the opinions of professional transportation planners in regard to transportation-related questions to be placed on the 1980 Census Questionnaire. Over 20 informed persons were polled regarding the importance of several work-trip-related questions. A summary of these responses is given in Table 1.

One must note that status of the questions as they were in May 1977 are indicated in the last column of Table I. The question on area #8 is of concern since GDOT expressed a desire to have this question included on the 1980 Census Questionnaire. One can note that this question was not included on any of the pretests.

REPORT ON THE 1980 CENSUS AT THE TRANSPORTATION RESEARCH BOARD MEETING JANUARY 1978

Mr. Marshall Turner of the Bureau of Census gave a status report on the 1980 Census at the Transportation Research Board meeting in Washington, D. C., in January 1978. He indicated that the questions on the entire questionnaire had been "firmed up" and the final questionnaire was in the hands of the printer. Mr. Turner indicated that the questionnaire needed to be approved by Congress but he implied that this approval was a formality. A "Dress Rehersal" for the final document will be held in three cities prior to the actual conduct of the official census in 1980. A copy of the final Census Questionnaire used for the "Dress Rehersal" in Richmond, Virginia, is shown in Figure 1. The work-trip-related questions are numbered 24 to 25. Figure 1 is the "long form" of the Census Questionnaire in which transportation-related questions are posed. Figure 2 is a copy of the "short form" which is also being used in the "Dress Rehersal". (Transportation questions are not contained in this form.) The sampling rate for households receiving the "long form" is 16.7% (1 out of 6). The "short form" will be sent to the remaining households that did not receive the "long form" (83.3% of the households).

Mr. Turner discussed the coding procedure for the questions 24 and 25 on the "long form". Great concern was shown by the participants at the TRB meeting in the coding of the destination portion of Question 24. Mr. Turner indicated that the coding of the questionnaires would not be done at a local level, but would be done at three regional coding centers in the United States. Problems in coding questions 24 and 25 will be referred back to the Metropolitan Planning Organizations (MPO) for the area of concern.

This arrangement appeared to the authors as being filled with many problems.

A discussion of geocoding was also held during Mr. Turner's presentation. The participants in this TRB session indicated that they were dissatisfied with previous attempts at geocoding, particularly the use of the DIME system developed for the 1970 Census.

Conclusions and Recommendations

1. The final version of the 1980 Census Questionnaire has been set. The questionnaire will consist of a "long form" in which transportation-related questions are posed. The sampling rate will be 16.7% of the households (1 out of every 6). A "short form" will be sent to the remaining 83.3% of the households and will not contain any transportation questions.

2. "Dress Rehersals" will be held on the "short forms" and "long forms" of the Census Questionnaire in three U. S. cities. The first city in which the "Dress Rehersal" will be held is Richmond, Virginia.

3. "Great concern" is the general mood of those who will be using the Census data for transportation planning. These persons are primarily concerned with the coding of the destination portion of the work trip. Previous efforts have been unsatisfactory in the validity and the amount of information provided by this coding effort.

Table I

Summary of Responses to Work Trip Related Questions for the 1980*

Questions on Area of Interest	Mode	Inference	Current Bureau of Census Status
#1 Destination of Work Trip	Priority #5**	Should be included in Census Instrument	Included
#2 Nearest Intersection to Work	Priority #1	Should not be included in Census Instrument	Not Included
#3 Modal Split	Priority #4 & 5	Should be included in Census Instrument	Included
#4 Occupancy	Priority #4	Should be included in Census Instrument	Included
#5 Travel Time to Work	Priority #4 & 5	No Conclusion	Included
#6 Distance to Work	Priority #1	Should not be included in Census Instrument	Included (Could be Deleted)
#7 Travel Route to Work	Priority #1	Should not be included in Census Instrument	Not Included
#8 Time of Departure from Home	Priority #3	No Conclusion	Not Included

*Source: GDOT Report, "Status of the 1980 Census Instrument", May 1977.

**# Gradation as follows: #1 Low Priority
#5 High Priority.

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332

SCHOOL OF
CIVIL ENGINEERING

TELE
(404)

March 23, 1978

To: Research Advisory Committee for Census-Transportation Planning Project

From: Dr. Donald O. Covault, Project Director

Re: Report of meeting in February 21, 1978

Attached is a report of the Research Advisory Committee for the Research Project GDOT/GIT 7005/E 20-609, for a meeting that was held on February 21, 1978. A number of major decisions regarding the conduct of the work on this project was made at this meeting based on the progress of the research to date. These decisions are summarized on the last page of the report under the title "Recommendations". The Recommendations are restated in this transmittal memo and are as follows:

1. The traffic assignment planned for the census project should not be made.

2. A comparison should be made in the gravity model trip tables obtained by the ARC and the Census procedures to determine if reasons can be stated for detected differences in total trips.

3. Mr. Phil Boyd should continue his work as previously planned.

4. A number of pros and cons as to usefulness of the work trip questions in the 1980 Census can be observed. This issue as to the usefulness of this information is not clear.

5. A detained report should be made of the meeting which states the findings of the project which led to recommmendations 1-4 above. This report fulfills Recommendation No. 5.

Please feel free to discuss this report with me if you wish.

cc: Mr. Hugh Tyner, Director
Research and Development Bureau
Georgia Department of Transportation
15 Kennedy Drive
Forest Park, Georgia 30050

REPORT OF THE RESEARCH ADVISORY COMMITTEE

(Report of the meeting held in the offices of the Georgia Department of Transportation February 21, 1978)

"DEVELOPMENT OF AN URBAN PEAK HOUR TRAFFIC MODEL BASED ON THE 1970 CENSUS AND CONCURRENT GROUND COUNTS, PHASE II"

PROJECT NO.: GDOT/GT 7005/E20-609

Prepared by:

Donald O. Covault, Professor of Civil Engineering

Mr. M. John Moskaluk, Graduate Research Assistant

Georgia Institute of Technology

March 22, 1978

ATTENDANCE AT MEETING

NAME	ORGANIZATION
Mr. Lamar Caylor	Georgia Department of Transportation (GDOT
Mr. Herman Griffin	GDOT
Mr. Grover Bowman	Federal Highway Administration (FHWA)
Mr. Tom Russell	(FHWA)
Mr. Tony Wang	(FHWA)
Dr. Donald O. Covault	Georgia Institute of Technology (GIT)
Mr. John Moskaluk	GIT
Mr. John Wilson	Atlanta Regional Commission

The major business at this meeting concerned problems in using the 1970 census data to replace conventional origin-destination surveys for Transportation Planning. Several major problems have become apparent as the researcher have progressed with the work. These problems are as follows:

1. Problems in coding the destination of the work trip. Approximately 50% of the responses to the destination work trip question on the 1970 census were uncodable to a zone of destination for various reasons. Many of these problems were reduced by assigning trips to various zones based upon common-sense mathematical approaches such as assigning trips to zones based on employment. However some of the trips had to be assigned in a more subjective manner.

2. The trip generation equations that were used in the building of equations using census data were calibrated using equations developed by the Atlanta Regional Council (ARC). The ARC equations were based upon the results of 1/2% Origin-Destination Survey made for the Atlanta

SMSA in 1972. Using this information as a base, trip generation equations using census data were built. The production and attractions that were built had the following characteristics.

(a) The coefficient of multiple determination (R^2) for the ARC equations and the census equations were quite similar.

(b) The standard error for the census equations was 4 or 5 times as large as the standard error for the ARC equations. The usual standard error for the ARC equations was approximately 1000 while the standard error of the census equation was about 5000.

3. Based on the trip productions and attractions calculated from the census equations, trip distribution using the gravity model was done. Total trips calculated by the ARC procedure did not agree well. Total trips by the census procedure exceeded the ARC study by 1,500,000 trips out of a total of approximately five million trips per day in the Atlanta SMSA.

4. Using the trip interchanges obtained in (3) above to make traffic assignments and model splits did not appear feasible since the Census and ARC trip tables did not compare well. Of the 13,000 links in the network for the Atlanta region, traffic volume counts were available for 263 links. One can argue that making a comparison of volume counts and assigned values on only 263 out of 13,000 links will not be valid because of the small number of links on which comparisons could be made. Furthermore, since the trip tables which would be used to make the assignment were questionable, the resulting assignment would also be questionable.

A second order of discussion at this meeting was the status of the work trip questions on the 1980 census. One may wonder if these questions will be of any value because of the problems which this study (and other studies

also) have experienced in using census data for transportation planning. It is the authors opinion that if the geocoding problem associated with destination of the work trip can be solved one of the major problems in using census data for transportation planning can be overcome. The work trip is a well-defined trip and also a large proportion of the trips which are made in the traditional morning and evening peak hour periods. Furthermore, the sampling rate for the work trip questions will be 16.7% (1 out of 6 households) and this rate is very large compared to the usual rate used in more traditional origin-destination surveys (5% in 1960 and 1/2% in 1972 for the Atlanta SMSA).

Therefore, one can argue that the 1980 census will provide valuable information for transportation planning provided the problems which have been outlined (particular the geocoding problem) are overcomed. However, it is the opinion of the authors that this issue is not certain and that a number of pros and cons exist as to the value of the transportation questions contain in the 1980 Census for transportation use in transportation planning.

Therefore, based on the discussion to this point in the meeting, the Research Advisory Committee suggested that the traffic assignments, which were scheduled for the next step in the work plan, not be done. The Committee suggested some type of comparision test be made in the trip tables obtained for distribution using the Census data and the ARC data. No details on the type of comparisons was specified in the discussion, but enough detail required to estimate the effect of differences in total trips (about 1.5 million/day) on the resulting trip interchanges. It is the opinion of the authors that no additional funds or time will be required to perform this comparison analysis.

A third order of discussion was the development of the peak-hour factor methodology by Mr. Phillip Boyd. Mr. Boyd is working on this project as

a part of his work on the Master of Civil Engineering Degree at Georgia Tech. None of the work proposed by Mr. Boyd will be affected by the decision not to perform the traffic assignment. Mr. Boyd will go ahead with his work as previously planned. He plans to finish his work about June, 1978. Mr. Boyd's work is being done at no cost to the project. His work will be used as a supplement to work on this project.

RECOMMENDATIONS

Based upon the discussions at the Research Advisory Committee the following recommendations were made:

1. The traffic assignment planned for the census project should not be made.

2. A comparison should be made in the gravity model trip tables obtained by the ARC and the Census procedures to determine if reasons can be stated for detected differences in total trips.

3. Mr. Phil Boyd should continue his work as previously planned.

4. A number of pros and cons as to usefulness of the work trip questions in the 1980 Census can be observed. This issue as to the usefulness of this information is not clear.

5. A detained report should be made of the meeting which states the findings of the project which led to recommendations 1-4 above. This report fulfills Recommendation No. 5.

DRAFT FINAL REPORT

RESEARCH PROJECT GDOT/GT 7005/E20–609

DEVELOPMENT OF AN URBAN PEAK–HOUR TRAFFIC MODEL BASED ON THE 1970 CENSUS AND CONCURREN GROUND COUNTS – PHASE II

By

Donald O. Covault
M. John Moskaluk

Prepared for

The Georgia Department of Transportation
In Cooperation With
The Federal Highway Administration

May 1978

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF CIVIL ENGINEERING
ATLANTA, GEORGIA 30332

1978

DRAFT FINAL REPORT

DEVELOPMENT OF AN URBAN PEAK-HOUR TRAFFIC MODEL BASED ON THE 1970 CENSUS AND CONCURRENT GROUND COUNTS PHASE II

RESEARCH PROJECT GDOT/GT 7005/E20-609

Project Director:

Donald O. Covault
Professor of Civil Engineering

Graduate Research Assistant
M. John Moskaluk

May, 1978

TABLE OF CONTENTS

TABLE OF EXHIBITS

I. INTRODUCTION

This research project, "Development of an Urban Peak-Hour Traffic Model Based on the 1970 Census and Concurrent Ground Counts - Phase II", is the second phase of the project started in 1970. The project is sponsored by the U. S. Department of Transportation, Federal Highway Administration in conjunction with the Georgia Department of Transportation. Work on the project began in January of 1977.

The primary objective of the research is the development of a peak-hour model for the Atlanta SMSA that is applicable to long-range planning and to TSM requirements. In conjunction with this objective, a special research project for a Master Degree in CE at Georgia Tech has been undertaken to develop a methodology to estimate peak-hour factors. A secondary objective is an evaluation of the transportation related questions contained in the 1980 Census Instrument.

The purpose of this report is to describe in sufficient detail the research procedures used and the conclusions derived. Each of the research objectives are considered separately in the report. In addition, a number of technical memorandum have been prepared during the project. A summary description of these memorandum are included in the report and where applicable the reader is referred to the particular document for further information.

This research project has been conducted by the Georgia Institute of Technology, School of Civil Engineering. Dr. Donald Covault, Professor, is the Principal Investigator. He and his two assistants, for purposes of this report are considered the Research Team. Likewise,

the opinions and conclusions expressed or implied in this document are those of the Research Team. They are not necessarily shared by the sponsors of this project.

The authors would like to acknowledge the technical assistance received from the Georgia Department of Transportation, the Atlanta Regional Commission and the U. S. Bureau of Census. We especially thank Mr. Herman Griffin of the Georgia Department of Transportation, Mr. John Wilson of the Atlanta Regional Commission, and Mr. Marshall Turner of the U. S. Bureau of Census. These individuals greatly assisted the Research Team through their continued willingness to answer questions and furnish data.

BACKGROUND

Great efforts have been expended in the Atlanta Region on the development of a rational and balanced transportation program. Past studies have concentrated on comprehensive, cooperative, and continuing plan development. On a continuing basis, the transportation plan must be monitored and updated to account for urban growth and change. Plan revisions are especially important in the short range to achieve the optimum utilization of existing facilities. Consistent with this attitude and in an attempt to replace the need for origin-destination studies, the U. S. Department of Transportation in cooperation with the U. S. Bureau of Census collected work trip information in the 1970 Census Instrument. Sample size for these data is approximately 15 percent.

Of particular concern and interest is the tabulation of work trips by mode between the zone of residence and the zone of employment

(the destination). The Bureau of Census has coded these trips by traffic analysis zone and furnished this information to the Georgia Department of Transportation as the 1970 Census Urban Transportation Planning Package (UTPP).

In 1970, the Georgia Department of Transportation (GDOT) in cooperation with the Federal Highway Administration engaged the Georgia Institute of Technology to conduct research using the UTPP file. The objective of the research (Project Number 7005-Phase I) was the development of a peak-hour, work-trip oriented forecasting model for the Atlanta SMSA area. The model was intended to give the planner an analysis tool to assess the transportation conditions of an urban area.

The UTPP file was received by GDOT in May, 1974. After a detailed review, it was concluded by GDOT that the work trip table developed by the census was unacceptable for traffic assignment. The primary reason was the manner in which the Bureau of Census geocoded the work trip destinations. Specifically, respondents were asked to provide an explicit street address for their place of work. An address coding guide (ACG) was then used to code that trip. Unfortunately, the ACG did not cover the entire Atlanta SMSA; it was limited to the area contained inside the perimeter. Hence SMSA residents whose place of work was not within the ACG description had their work trip destination coded to a zip code number (ZC), an enumeration district (ED), or a universal area code (UAC). Respondents who did not provide an adequate or complete work address were coded with undesignated destinations using a dummy number equal to 99998.

Thus, the primary deficiency of the Atlanta UTPP file is that only 56 percent of the work trip destinations are coded to traffic analysis zones. The remainder are coded to either ZC, ED, UAC or to 99998.

Similar difficulties were encountered in other urban areas. In the Delaware Valley Planning Region only 35 percent of the region's nearly 2 million work trips were coded to traffic zones. Albuquerque, New Mexico reported 64 percent, Wilmington, Delaware reported 55 percent, and California averaged 57 percent for 14 SMSA's. Because of the inadequate coding, the Tri-State Regional Planning Commission abandoned their attempt to use the UTPP data and requested the Bureau to generate a worker file.

At that time Project Number 7005-Phase I was terminated because of the poor geocoding of the work trip data. It was concluded that the UTPP file did not provide the desired level of data.

Between 1974 and the early part of 1976 no work was accomplished on the UTPP file. Then in 1976, GDOT requested Dr. Covault to take another look at developing a peak-hour model using the UTPP file. The present contract (7005-Phase II) was consummated from these renewed interests.

REPORTS

A number of technical memorandum have been prepared by the Research Team during the project. These memoranda have a specific topic and have been used to inform the Georgia Department of Transportation of project progress and findings. The following is a brief description of the various memoranda.

WORK PLAN: Development of an Urban Peak-Hour Model Based on the 1970 Census and Concurrent Ground Counts, Phase II, February 22, 1977 (1)

This memorandum describes in detail the proposed research. It delineates the project stages and the tasks associated with each stage. The detailed work plan has been accepted by the Georgia Department of Transportation and the Federal Highway Administration.

EXECUTIVE SUMMARY: April 7, 1977 (2)

The summary deals with the conclusions and findings of the Phase I portion of the project. Additionally, the memorandum describes the findings from the comprehensive literature search.

Interim Report: Status of the 1980 Census Instrument, May, 1977. (3)

The report addresses two topic areas:

1. The Research Team's preliminary findings and status of the 1980 Census Instrument. It recommends that if the State of Georgia desires to suggest changes to the Instrument questions, the State should move quickly because the Instrument will probably be finalized by the summer of 1977.
2. The Research Team has developed a questionnaire to determine the interest in tranportation information being collected through the Census. The findings and conclusions of the questionnaire are summarized in the report.

Technical Report for Stage C: Status of Transportation Questions on the 1980 U. S. Census, March 20, 1978 (4)

This report presents a summary of the status of the 1980 Census Instrument. It discusses the pretests that have been held in 1977 and the proposed pretests scheduled for 1978. The report also states that the 1980 Instrument is in final form and will be presented to Congress for approval which normally is a formality.

Report to the Research Advisory Committee, March 22, 1978 (5)

The report presents the minutes of the meeting held on February 21, 1978 between the Research Advisory Committee and the Research Team. The significant conclusion of the meeting is that the research project should be terminated. The justification and rationale for this termination is discussed in Chapter 2 of this report.

Technical Report for Stage B: Research Methodology, May, 1978 (6)

The report presents a summary of the methodology utilized in the project. It is in sufficient detail so that the reader can achieve an understanding of the procedure. Weakness of the procedure are pointed out to alert other researchers of potential problem areas.

II. METHODOLOGY

The research project has two distinct components. The first in the development of a peak-hour methodology for the Atlanta SMSA based on the 1970 Census journey to work trip information. The second component is a review with recommendations of the transportation related questions to be included in the 1980 Census Instrument. This chapter is divided into two sections with the first addressing the peak-hour methodology and the second discussing the 1980 Census questions.

PEAK-HOUR METHODOLOGY

A library search has been conducted early in the project. Numerous techniques employed by other researchers have been reviewed. Two research efforts are reported in sufficient detail to explain the technique employed and the conclusions derived. The first report is Travel Demand Forecast Models, Phase 2 [7], and the second one is The Use of Census Data for Updating Urban Transportation Studies [8].

The Travel Demand Forecast Models, Phase 2 report describes the results of calibrating a peak-hour model for the St. Louis, Missouri area. The model that has been developed in St. Louis is based on the postulation that a relationship exists between 24-hour, home-to-work travel and total peak-hour travel. The model also postulates that travel varies as a function of zone-to-zone travel time and the employment density at the attraction zone. Based on the number of attributes, i.e., high percentage of work trips during the peak-hour and the stability of the home-to-work trip, the report concludes that the home-to-work travel is a good determinant of peak travel.

Two models, one for auto drivers and one for transit, are considered. The general conclusion is that the models over-estimate actual trips by 17.8 percent. This slight over-estimate is concluded to be reasonable. Further the report concludes that good correlation exists between the 1965-66 Origin and Destination Study and the Census work trip frequency distribution.

The methodology that has been developed in St. Louis is not used directly in this research approach. However, the report has been used as a continual reference because of its excellent summary of model methodology and the adjustments required to the Census data. The reader is directed to the Executive Summary prepared by Georgia Tech in April, 1977 for further details.

The second report which is directly applicable to this research is the Use of Census Data for Updating Transportation Studies. For purposes of this report, this study will be considered the Comsis Report. The Comsis Report describes the adequacy testing of three methods of forecasting average daily traffic volumes in the State of Rhode Island. Comsis Report Method 3 is considered most applicable to the present research. Briefly stated, this method is:

> "Determine the accuracy of average daily auto driver link volumes developed by estimating average daily trip productions and attractions as a function of the primary work trip productions and attractions and other socio-economic variables that are reported in the Census documents" [8]

Method three is based on the assumptions that a relationship exists between average-daily and primary work trip productions and attractions. Given this relationship, i.e, primary work productions and

attractions from the Census journey-to-work trip information and a calibrated distribution and assignment model, to follows that ADT link volume estimates can be developed. This technique has been used by Comsis and they have reported approximately a 3 percent under-estimate when compared to ground count information. Again the reader is directed to the April, 1977 Georgia Tech Executive Summary.

Based on the Library Search and discussions with the sponsoring agencies, the Research Team has developed a set of hypotheses to research the possible development of a peak-hour model for the Atlanta SMSA. These hypotheses include:

- A relationship exists between 24-hour journey-to-work trips and all-purpose peak-hour trips. (All purpose is defined to include home based work, shop, social, recreation, school, and other as well as non-home based travel.)

- A mathematical proportioning technique founded on employment distribution can be developed and used to allocate undersignated work trips in the Census journey-to-work file.

- The traditional planning techniques using calibrated models, i.e., gravity, logit modal split and assignment, which have been developed by others can be used to generate an all-purpose link volume.

- The 1970 historical record (HR) network can be used to assign the all-purpose trip table.

- A peak-hour factoring methodology stratified by socio-economic parameters can be developed so that the by-purpose trip tables can be converted from 24-hour to peak-hour and then merged.

- Generalized peak-hour factors can be developed and applied to 24-hour assigned link volumes.

- An evaluation analysis can be developed that uses the 265-ground count data collected in Phase I of this project.

It should be noted that there are two distinct methodologies suggested in the hypothesis statement. The first method factors the by-purpose trip tables and then merges these factored tables into an all-purpose peak-hour trip table. This all-purpose trip table is then assigned to the HR with the end results being synthesized peak-hour link volumes. These volumes can then be compared with the 265-ground count locations and accuracy of the methodology can be ascertained. The second procedure uses an all-purpose 24-hour trip table for the assignment. The 24-hour link volumes are factored to represent peak-hour flow for evaluation with the 265-ground count locations. This second procedure is the traditional approach that is often used in the 3-C transportation planning process. In Atlanta, the standard FHWA peak-hour factors have been augmented where possible with data collected in 1972.

At the beginning of this research project, the Research Team was prepared to develop the necessary analytical techniques to test and evaluate both of the procedures. It was anticipated that one of these techniques would yield a useful product for the Atlanta SMSA. It was further anticipated that the selected methodology would be directly transferable to other SMSA's in Georgia.

In 1972, Georgia Department of Transportation/Atlanta Regional Commission (GDOT/ARC) conducted a half of one percent origin-destination survey in the Atlanta SMSA seven county area. The sample consisted of 2851 dwelling units which represent 18,527 all-purpose trips. Additionally, studies were made to estimate special generator trips, truck travel and external trips. The traditional transportation planning process followed this work.

Of particular importance to this research project is the calibrated models and the trip tables for truck and external travel. These data are used as the foundation for the Census file analysis and the development of a peak-hour model. From the time that this project was formulated, the Research Team has presumed that the use of these data provided the most expeditious utilization of previous projects. This assumption has proven to be a major weakness in the research methodology. For a detailed explanation and analysis of the GDOT/ARC transportation planning process methodology the reader is directed to the document Atlanta Region Transportation Planning Models[9]

The following portion of this section is devoted to a detailed description of the steps undertaken during the research project. Each step is written as a separate entity; however, there are many avenues of feedback that have been dropped for clarity. The University of Georgia at Athens IBM 370/158 MVS computer facility has been used for processing the FHWA Transportation Planning Battery of programs and the numerous Research Team developed programs. All of the programs developed by the Research Team are written in Fortran IV and are available to the sponsoring agencies.

Step One - Development of an Equivalence File

In recording the journey-to-work trip data, the Bureau of Census has used traffic analysis zone information furnished by the Georgia Department of Transportation. Where it was impossible for a variety of reasons to code the work attraction end of the trip, the Bureau has used dummy codes supplied by GDOT that represent zip codes, enumeration

districts, universal codes and undesignated destinations.

The traffic analysis zones given to the Bureau of Census are made up of 1548 zones that correspond to the zoning system used prior to 1970. These zones are nonsequentially numbered Ø to 8994. Based on the Research Team's investigation, this numbering system does not violate Census Tract boundaries and corresponds directly to the 525 zone system that has been developed since 1970.

It should be recognized that the two traffic analysis zone systems (1548 zones and 525 zones) represent the same study area. Thus on numerous occasions, the 525 zone system is composed of more than one zone from the 1548 system. In essence, the 525 zone system is a aggregation of zones into more homogeneous units at a higher degree of manageability.

To code work trip destinations to zip codes, universal area codes and enumeration districts, the Bureau of Census has used the GDOT furnished dummy numbers. The dummy number equivalence for each of these designations is:

Designation	Dummy Number Range
Zip Codes	9001-9451
Universal Area Codes	9452-9480
Enumeration District	9481-9621

By subtraction, it is obvious that there are 620 additional designations that must be converted to traffic analysis zones.

It is cautioned that this conversion is not a straightforward matter. The Georgia Department of Transportation does not have complete files as to what particular areas within the study area are represented by the dummy codes. Further, much of the data concerning the dummy

numbers is conflicting. The dummy numbers have presented an enigma which in many cases has been solved by engineering judgement.

Some of the problems associated with using the dummy numbers are:

- Zip codes and universal area codes violate census tract boundary; they do not conform uniformally to traffic analysis zones.
- Enumeration districts are numbered to correspond to the County in which they are located. For example, the same enumeration district number can appear in more than one county.
- Dummy numbers do not conform to a rational geographic representation of the area. For example, it is common to have dummy numbers represent a particular area which is geographically impossible.
- The postal service does not have a comprehensive zip code map so that a rational geographic boundary can be associated with a zip code.
- A zip code is not an appropriate surrogate descriptor because the place of work is not indicated by the zip code. Employees of the Gulf Oil, for example, work south of the CBD but the zip codes associated with Gulf Oil in the main Post Office is in the heart of the CBD. This is not a unique occurrence but instead it is a typical situation for the large corporation located in the Altanta SMSA.

Because of these associated problems with zip codes, universal area codes and enumerations districts and their related dummy numbers, the Research Team urges the Bureau of Census not to use these surrogate descriptors.

Recognizing the above problem, the Research Team has proceeded in the development of the equivalence file. A member of the Research Team has interviewed the Public Relations Director at Atlanta's Main Post Office to resolve zip code conflicts. The Director, in turn,

has discussed the boundaries with many of the postal staff, especially the mail carriers. At the beginning of this conversion effort, the Research Team used a zip code map prepared by ARC. However, this map has been found in error. Thus, the Research Team has concluded that the discussions with the postal staff are the highest level of reliability possible, to determine zip code boundaries

In a similar manner, a member of the Research Team has interviewed the local Bureau of Census in defining the boundaries of enumeration districts. Again, this process has proved to be tremendously subjective and relied heavily on the local knowledge of the Bureau of Census staff.

For both zip codes and enumeration districts, the Research Team has equated the appropriate zones from the 525 zone system. The Universal Area Code work trips have been distributed using a calibrated gravity model. This process is discussed later in this report.

In summary, a subjective analysis has been devised to equate dummy descriptions used in UTPP file to the 525 zone system. In a non-statistical subjective manner, the Research Team estimates that the use of this type of engineering judgement has caused approximately a plus or minus 30 percent error in the completed equivalence table. However, it has been further concluded that this approach is the best possible without attempting to re-do the work previously undertaken by the Georgia Department of Transportation and the Bureau of Census. It is also suggested that a complete revision of the UTPP file by the Research Team is not possible because of anonymity problem and the associated cost.

Step Two - Development of Equivalence Computer Program

Once the equivalence table was complete, a computer program has been developed to convert the UTPP file into the 525 zone system. In its original form, the UTPP file contains 51,751 records. A record in this context represents a zonal "i-j" pair with "x" journey-to-work trips associated with that pair. It should be recognized that the UTPP file represents the 24-hour home-to-work trip pattern. The UTPP file does not contain any data concerning the work-to-home trip. This is an important consideration because in Atlanta the highest peak hour occurs in the PM when the work trip is predominantly work-to-home.

When the UTPP file is investigated in detail, the following statistics are readily apparent:

Work Trip Destinations Allocated to	Number of Trips	Percent of Total
1548 Nonsequential Zones	328,168	56.5%
Zip Code Designations	161,958	27.8%
Enumerations Designations	216	0.1%
Universal Area Code Designations	38,003	6.5%
Not Allocated	53,148	9.1%
Total Trips	581,943	100.0%

It is interesting to compare the work total trips (expanded) from the UTPP file and the work total trips estimated by GDOT/ARC. In comparison,

UTPP Work Trips = 581,943
GDOT/ARC Work Trips = 1,045.422
Difference 463,479 or (-44.3%)

The UTPP expanded files underestimates the DGOT/ARC estimate by 44.3 percent. The logical question to ask is which estimate is correct. UTPP estimate has a high degree of intuitive appeal because it is derived from approximately a 15 percent sample. However, the GDOT/ARC estimate has undergone an accuracy check and their estimate satisfies the limits of tolerance. The question remains unanswered as to which estimate is correct. Perhaps when the U. S. Bureau of Census Housing Survey becomes available, the work related questions in that survey will shed some information concerning the order of magnitude of the number of work trips.

Considering the summary table above, the computer must convert the unallocated trips (approximately 44 percent) to the 525 zone system. In addition, the 1548 nonsequential zones must be converted to the 525 zone system. Finally, the program must merge all of these trips together into a Census journey to work trip table in terms of the 525 zone system. Theoretically, this trip table is a 525 x 525 matrix.

Specifically, the program accomplishes the following tasks:

- Assign the residential zone (1548 nonsequential) on a zone by zone basis to the 525 zone ststem.
- Check the destination end of the "i-j" pair to determine if it is a nonsequential zone, a zip code, a universal area code, an enumeration district or an unallocated destination.
- If it is a nonsequential zone, assign it directly to the appropriate zone in the 525 zone system.
- If it is a zip code or enumeration district, distribute the trip to the dummy destinations using the formula

$$t_j = T_j \frac{e_j}{E_j}$$

where:

T_j = number of trips calculated for the individual dummy zone

e_j = the number of employees in that dummy zone

T_j = the total work trips associated with the dummy description

E_j = the total number of employees in the dummy description

(Note: The above formula was derived by the Comsis Corporation and reported in their study The Use of Census Data for Updating Urban Transportation Studies.[8] A detailed explanation of the rational of the formula is contained in the Georgia Tech Executive Summary).

- After the journey-to-work trips are proportioned among the zones in the dummy descriptions, the dummy zones are assigned directly to the appropriate zone in the 525 zone system.
- If it is a universal area code or an unallocated dummy description, the program generates a separate file and assigns and totals the number of trips to the appropriate origin zone.
- After considering all 51,751 records, the program stores two files, i.e.,
  1. allocated UTPP trips in terms of the 525 zone system.
  2. unallocated UTPP trips by zone of origin.

From the GDOT/ARC data, the Research Team has obtained the work related friction factor (F_{ij}'s) file. This file in conjunction with the FHWA Battery program "GM" and the unallocated UTPP trips are processed to generate a trip table that distributes the UTPP trips and the trip interchanges from the GM procedure to yield a composite trip table. In summary this trip table represents the trip interchanges as

reported in the 1970 Census Instrument modified to account for the various aberrations described above. The remainder of this report will refer to this product as the UTPP trip table. The reader is reminded that it is modified and subject to all errors associated with engineering judgement, dummy descriptors and the proportioning technique to allocate trips.

Step 3 - Development of All-Purpose Trip Generation Models

A verbal agreement of the research contract is that the Research Team will make maximum utilization of existing GDOT/ARC data base. Included in this agrement is all of the previous transportation planning effort accomplished by the participating agencies. In particular, the Research Team agreed to utilize the existing data base and the available models where appropriate in the research application.

Two models that are not available are the trip generation models for all-purpose productions and attractions. To build these models, the Research Team has used the GDOT/ARC data base. Thus, the models derived reflect the same level of data accuracies as the GDOT/ARC models.

To derive an all-purpose home-based trip productions, model the Research Team has used the GDOT/ARC cross-classification matrices. For each stratification, the by-purpose trip production rates are cummulated to give an all-purpose home-based trip production matrix.

For further clarification the reader is directed to Exhibit 1. This Exhibit, Home Based Work Trip Productions is reproduced from the ARC publication Atlanta Region Transportation Planning Models;[9]

EXHIBIT 1

HOME BASED WORK TRIP PRODUCTIONS

Persons Per Household	Automobiles Per Household		
	0	1	2^+
1	0.600	0.896	1.714
2	1.000	1.600	2.300
3	1.417	2.250	2.750
4^+	1.850	2.000	2.900

SOURCE: Atlanta Region Transportation Planning Models Technical Documentation, Atlanta Regional Commission, December, 1976.

also, the document that provides a detailed explanation of the by-purpose cross-classification matrices. The stratifications of the matrix are persons per household vs. autos per household. To find a particular rate, all one needs to do is to select the correct row and column and read the trip rate at the intersection of the row and column. For example, with 2 persons per household and 1 auto per household, the home-based work production rate is 1.600.

The next Table , Exhibit 2, is the all-purpose home-based trip production matrix. In a similar manner, to select a particular rate, determine the appropriate row and column and read the rate at the intersection. In this case, 2 persons per household with 1 auto per household has an all-purpose home-based trip production rate of 4.672. With this stratification, the average household on the average makes approximately one out of three trips to or from work.

To relate this all-purpose matrix to the UTPP file, the all-purpose matrix has been made a function of the work trip production and is illustrated in Exhibit 3. This is accomplished by dividing each cell of the matrix by the corresponding work trip rate. Using the same example, the all-purpose productions (4.672) divided by the work productions (1.600) yield a value of 2.920. This value is interpreted as the all-purpose productions divided by the work purpose productions. Literally, it has the same definition as above, the average two member household makes approximately one out of three trips to or from work.

The second model that has been derived is the trip generation for all-purpose attractions. This includes the home-based and the non-home-

EXHIBIT 2

ALL-PURPOSE HOME-BASED PRODUCTIONS

Persons Per Household	Automobiles Per Household		
	0	1	2^+
1	1.751	2.316	3.573
2	1.998	4.672	5.453
3	3.550	6.110	8.250
4^+	5.494	8.100	12.350

EXHIBIT 3

ALL-PURPOSE PRODUCTIONS/WORK PURPOSE PRODUCTIONS

Persons Per Household	Automobiles Per Household		
	0	1	2^+
1	2.918	2.585	2.084
2	1.998	2.920	2.371
3	2.505	2.716	3.000
4^+	2.970	4.05	4.258

based attractions. Multiple regression techniques using the Biomedical Computer Program BMD02R [9] are used to build the model. This computer program generates a sequence of multiple linear regression equations in a stepwise manner. At each step, one variable is added or deleted to the regression equation. The variable that is added is the one which makes the greatest reduction in the error sum of squares. Equivalently, it is the variable which has the highest partial correlation with the dependent variable partialed on the variables which have already been added.

In the particular analysis, the dependent variable is "y" all-purpose trip attractions. Generally, the expected multiple linear regression equation has the form:

$$y = B_o + B_1x_1 + B_2x_2 + ... + B_nx_m + e$$

where:

y = the dependent variable all-purpose trip attraction

x_1-x_n = the independent variable which are discussed below

B_o-B_n = the regression weights

The first attempt to develop a regression equation used six independent variables which are:

x_1 = total autos

x_2 = total population

x_3 = total employment

x_4 = employment land-use

x_5 = school enrollment

x_6 = work attractions

The GDOT/ARC zap file of socio-economic data has been utilized as the base for the multiple regression analysis. The Research Team has expanded the Zap file by adding GDOT/ARC developed information concerning trip generation data. No modifications or alteations have been made to these data.

A standard technique to select the variables that should remain in the multiple linear regression equation is plot a of R^2 multiple correlation coefficient for the number of variables. This plot is shown in Exhibit 4. It is evident from an investigation of the graph that the rate of change of R^2 becomes quite small after the inclusion of two variables. This indicates that the optimum number of variables to be included in the equation is two which are work attractions and total population. In addition, a detailed residual analysis has been conducted. It should be recognized that the square of the residuals divided by the degrees of freedom is an estimate of error. Consequently, if the residuals can be reduced in a rational manner, the error estimate will also be reduced.

In the development of a multiple linear regression model, a number of trial runs using the BMD02R program have been performed. A summary table of this analysis is shown in Exhibit 5. It indicates the variables that have been included in the equation, R^2 and the standard error. From the analysis, the equation that is selected for use in this research project is:

$$y = 45.47 + 1.808\ x_6 + 1.419\ x_2$$

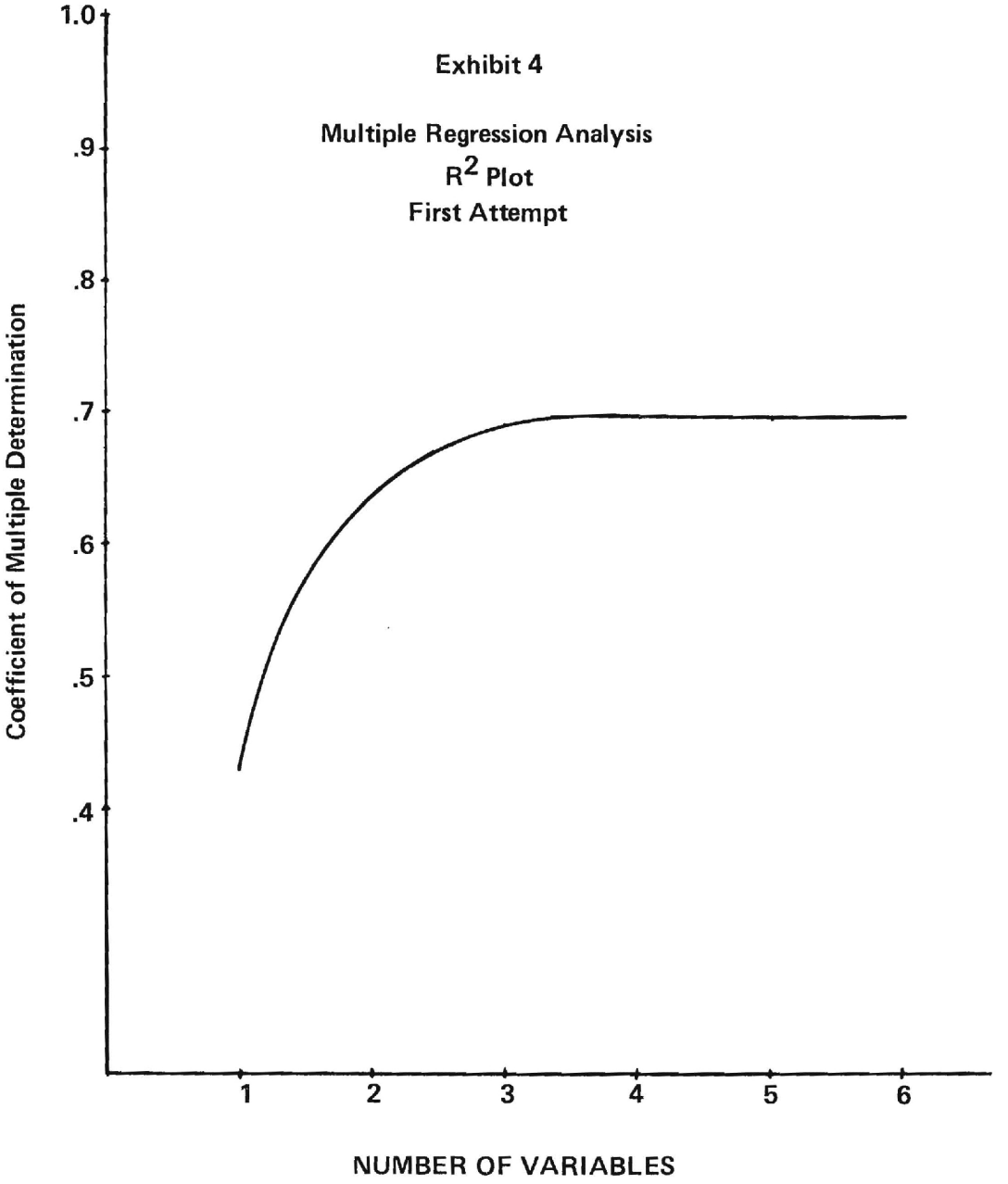


Exhibit 4
Multiple Regression Analysis
R^2 Plot
First Attempt
Coefficient of Multiple Determination
1.0
.9
.8
.7
.6
.5
.4
1
2
3
4
5
6
NUMBER OF VARIABLES

EXHIBIT 5

SUMMARY TABLE OF REGRESSION ANALYSIS

Run Description	Total Attr. Mean	Total Attr. S. D.	Constant	V1	V2	V3	R	R^2	R^2 Change	S. E.
AT TPOP TE ELU SCHL WKATR	9497	8756	4978.8	1.872 (WKATR)			.605	.367	.367	6977
			139.6	1.879 (WKATR)	3.598 (AT)		.778	.605	.239	5515
			47.8	1.790 (WKATR)	2.919 (AT)	137.581 (SCHL)	.814	.662	.057	5108
DELETE AT	9497	8756	4978.8	1.872 (WKATR)			.605	.367	.367	6977
			-222.3	1.899 (WKATR)	1.743 (TPOP)		.761	.579	.212	5698
			-42.8	1.806 (WKATR)	1.351 (TPOP)	135.554 (SCHL)	.795	.631	.053	5336
DELETE AT, TPOP	9497	8756	4978.8	1.872 (WKATR)			.605	.367	.367	6977
			3412.3	1.735 (WKATR)	214.478 (SCHL)		.725	.525	.159	6046
			3005.9	1.592 (WKATR)	200.452 (SCHL)	10.428 (ELU)	.732	.536	.011	5988
CONSIDER TP & WKATR AFTER	8144	6870	4070.1	1.828 (WKATR)			.669	.447	.447	5115

where:

y = the dependent variable - all-purpose attraction in each zone

x_6 = the independent variable - total work attractions in each zone

x_2 = the independent variable - total population in each zone

A logical comparison is to analyze this equation versus the various trip generation attraction equations developed by GDOT/ARC. An all-purpose multiple linear equation has intuitive appeal because it represents an aggregate rather than a stratified sample. In this particular comparison, the statistics do not support this hypothesis. If only the statistics are judged, the by-purpose regression equations appear to be better. However, the Research Team opinion is that this comparison is inclusive because the bias in the GDOT/ARC equation is unknown. Although the above equation does not have the desired statistics, it has been judged adequate for the development of a research methodology. This conclusion is especially consistent when it is realized that it is beyond the scope of this project to collect the necessary data to build a more precise model. The GDOT/ARC half of one percent origin destination survey is the best data available in the Atlanta region.

Step Four - Development of an All-Purpose Trip Table Using the UTPP File

This step involves the building of an all-purpose trip table using the modified UTPP file, the trip generation equations and the special generator information previously developed by GDOT/ARC. It is a straight-

forward procedure to combine these data and equations and build an all-purpose trip table. A computer program has been devised to perform this task. The 525 x 525 trip table matrix is stored on the Research Team's private disk at the University of Georgia computer site.

THE DICHOTOMY

The objective of this particular research is to develop a peak-hour model methodology using the 1970 Census UTPP file. To reiterate, the UTPP file is a description of the journey-to-work trip by mode of travel. In the case of Atlanta, approximately 56 percent of the trips have been coded to the traffic analysis zone system. The remainder have been coded to dummy numbers that describe a surrogate system.

Just prior to the development of the all-purpose trip table, an intense discussion began among the Research Team. The debate centered on the validity of peak-hour model as a function of the UTPP file. All of the models that have been built as well as all work in support of the research effort is based on information developed in the GDOT/ARC transportation planning process. That is to say the peak-hour model developed from the UTPP data is directly dependent on the GDOT/ARC effort. The direction of the debate led the Research Team to re-examine the functional intent of the research effort. This analysis led to the basic conclusion that the UTPP data cannot be alone but is dependent on calibrated models developed during the traditional transportation planning process. At least this is the case for the methodology pursued by the Research Team.

A point of the debate is that it is inconclusive to perform an

analysis of potential peak-hour model link estimates and actual ground counts. For example if the analysis showed no significant difference between the ground counts and synthetic volumes, it is not possible to discern if the peak hour methodology is adequate or if the traditional models used in support compensate for shortcomings. Likewise, the same inconclusive dilemma would occur if the comparison indicated a significant difference.

This is a perplexing situation since the work trip is a well-defined and also a large proportion of these trips are made in the morning and evening peak-hour periods. Furthermore, the sampling rate of the UTPP file is approximately 15 percent, a much larger sample size than Atlanta 1970 half of one percent origin - destination survey.

Because of this reliance on existing models from the traditional planning process, the problems in geocoding the journey-to-work data and the necessary engineering judgement required to completely allocate the UTPP, one may wonder if the transportation questions asked in the Census Instrument are a substitute for the origin-destination study. The answer to this question is inconclusive. Based on the methodology that has been used by the Research Team, the answer would have to be that the UTPP file cannot be substituted for an origin-destination study. However, the Research Team has not examined an exhaustive set of methodologies that equate the journey-to-work trips with all-purpose trips.

This dilemma has been discussed with the Research Advisory Committee. The general consensus is that the project should be stopped without performing an assignment because the effort would not yield a useful result. The Research Team has stopped further work on the project

and this report reflects the accomplishments of the project up to the point of termination. A set of recommendations have been developed and are included in the last section of the report. The fact still remains that a peak-hour model applicable to TSM procedures is a valuable tool to the practicing transportation engineer.

CIVIL ENGINEERING MASTER DEGREE SPECIAL RESEARCH PROJECT

The secondary element of this objective is the development of a peak-hour factor methodology that can be used with the traditional transportation planning process. This research is being conducted as a Special Research Problem by a Georgia Tech graduate student in partial fulfillment of a Master of Civil Engineering Degree. This research effort will continue and will not be effected by termination of the peak-hour methodology research.

There are two approaches for developing design hour volumes. The first is to assign ADT volumes to a network and the resultant "smoothed" assignments factored to produce peak-hour volumes. The second approach is to convert the ADT by-purpose trip interchanges in trip table format to peak-hour trip interchanges. After the peak-hour trip interchanges are obtained they are assigned to the network and the resultant values are a peak-hour assignment.

The Special Research Project will assess:

(a) current methodology that is used in the Atlanta regional planning - Approach One

(b) by-purpose trip interchange peak-hour factors will be developed as a part of the research methodology - Approach Two

A brief description of the two approaches are:

Approach One - assess the design hour factor matrix employed in the Atlanta regional transportation planning process. The matrix which classifies the Atlanta highway sections by area and functional classification will be refined and supplemented with ground count data from Phase I of the present project and factors developed. The research will address the base year design hour factor matrix.

Approach Two - analyze the Atlanta by-purpose trip interchanges:

a. the 1972 home interview origin destination survey for work, school, shopping, social/recreation and non-home based trips.
b. the 1972 truck survey for trucks.
c. the 1972 external survey for internal-external trips.
d. from this analysis develop appropriate peak-hour factors.

The FHWA program PEAKHOUR will be used to process the survey trip records and stratify the data to obtain peak-hour factors. Factors will be established for person trips and auto driver stratified by all-purpose and by-purpose travel. Based on similar peak-hour studies completed in Baltimore, Maryland, the research will incorporate changes in the peak period travel based on regional socio-economic parameters. Peak period travel by-purpose will be examined in terms of trip ends stratified by income, number of autos, employment density, residential density and geographical distribution. The research will attempt to account for variation in peaking characteristics as a function of trip end travel and a knowledge of zonal characteristics. Thirty-four geographical (super-districts) zones has been defined for this analysis. The super-districts will be aggregated if similar peaking characteristics are discovered among the super-districts.

The validity and adequacy of the two approaches will be assessed based on available data in the Atlanta region. A statistical or

graphical method will be employed to evaluate the approaches. When this research is complete, a copy of the final publications will be available to the sponsoring agencies.

To reiterate, this Special Research Project has been created to compliment the analysis of the Census journey-to-work research. Even though Project 7005-Phase II has been terminated, the peak-hour research will continue. The special research and, its findings will be applicable to the on-going transportation planning being conducted by GDOT/ARC.

REVIEW OF THE 1980 CENSUS INSTRUMENT

The second objective of the research has been the investigation of the potential impact that could be made to the transportation questions contained in the 1980 Census Instrument. As of July, 1977, it became highly unlikely that any revisions could be made. But, it is important to discuss the findings of the Research Team as reported in a number of technical memorandums. The following is a discussion of these memoranda.

Transportation related issues first appeared in the 1960 Census Instrument. Again in 1970, transportation questions were asked. Transportation related areas in 1970 dealt with:

(a) The place of work (the question contained the number and street name, name of city, town or village, county, state and zip code).

(b) mode of travel (the question contained the categories of driver private auto, passenger private auto, bus

or streetcar, subway or elevated railroad, taxicab, walked, worked at home and other).

A number of problems were incurred in reducing the 1970 Census data. Most of the problems are related to the difficulties of geocoding.

It is planned by the Bureau of Census to ask transportation related questions in the 1980 instrument. The sample rate will be 1 out of 6 or 16.7 percent. In anticipation of these questions and because of previous problems, extensive efforts have been or are being made to update the Area Coding Guide. If this is accomplished, the geocoding problems will be reduced to a minimum. Further, the Bureau has conducted pretest in Austin, Texas, Oakland, California, and Camden, New Jersey in 1977. In 1978, additional "dress rehersals" will be conducted in three cities prior to the actual census in 1980.

The 1980 instrument contains the following questions that are related to the journey-to-work:

(a) Work Location
(b) Modal Split
(c) Auto Occupancy
(d) One-Way Travel Time to Work
(e) One-Way Travel Distance to Work

A copy of the 1978 pretest questionnaire for Richmond, Virginia is attached to the March 20, 1978 technical memorandum. Mr. Turner of the Bureau of Census has indicated that the Richmond, Virginia "dress rehersal" format will be the questionnaire that will be submitted to Congress for approval. He implied that this approval is a formality. So it appears reasonable to assume that the 1980 instrument will be the same as the questionnaire used in the Dress Rehersal.

Early in 1977, the Research Team sent a questionnaire[3] to a number

of individuals concerning the inclusion of the journey-to-work questions in the 1980 Census Instrument. A list of the individuals and a sample questionnaire are contained in the Appendix. The aim of the questionnaire was the determination of the prevailing opinion concerning collecting transportation data through the Census Instrument. A summary of responses is shown in Exhibit 6.

The Exhibit illustrates the question asked, the mode of the response, the inference and the current Bureau of Census Status. The information in the last category indicates whether or not the question area is included in the 1980 instrument. Generally, the Research Team Survey concludes that Census instrument should address question areas number one (destination), number 3 (modal split) and number four (occupancy). Question area number two (nearest intersection), number six (distance to work), and number seven (travel route) should not be included in the Instrument. No conclusions have been derived concerning area number five (travel time) and number eight (time of departures).

Three major conclusions are made in the State C Report, Status of Transportation Questions on the 1980 U. S. Census, March, 1978:

1. The final version of the 1980 Census Questionnaire has been set.

2. "Dress Rehersals" will be held on the "short forms" and "long forms" of the Census Questionnaire in three U. S. Cities during 1978.

3. "Great Concern" is the general mood of those who will be using the Census data for transportation planning. These persons are primarily concerned with the coding of the destination portion of the work trip. Previous efforts have been unsatisfactory in the validity and the amount of information provided by the coding effort.

EXHIBIT 6

SUMMARY OF RESPONSES TO WORK TRIP RELATED QUESTIONS FOR THE 1980 CENSUS*

Questions on Area of Interest	Mode	Inference	Current Bureau of Census Status
#1 Destination of Work Trip	Priority #5**	Should be included in Census Instrument	Included
#2 Nearest Intersection to Work	Priority #1	Should not be included in Census Instrument	Not Included
#3 Modal Split	Priority #4 & 5	Should be included in Census Instrument	Included
#4 Occupancy	Priority #4	Should be included in Census Instrument	Included
#5 Travel Time to Work	Priority #4 & 5	No Conclusion	Included
#6 Distance to Work	Priority #1	Should not be included in Census Instrument	Not Included (Could be Deleted)
#7 Travel Route to Work	Priority #1	Should not be included in Census Instrument	Not Included
#8 Time of Departure from Home	Priority #3	No Conclusion	Not Included

* Source: GDOT Report, "Status of the 1980 Census Instrument", May, 1977.

** # Gradation as Follows: #1 Low Priority
#5 High Priority

III. CONCLUSIONS AND RECOMMENDATIONS

From an evaluation of the results of the research project in comparison to the detailed work plan, it is plainly obvious that the research goal has only been partially achieved. That is, the research effort did not yield a peak-hour model methodology to estimate design hour volumes applicable to TSM procedures. In fact, a peak-hour model as a function of the UTPP file has not been developed. There are a series of questions that must be answered to explain the rational of the stated conclusion, i.e.,

- Why and what caused the research effort to fall short of the stated objective?
- Has the research effort been a waste of valuable resources in terms of manpower and dollars?
- Can a peak-hour model be developed that is directly dependent on the UTPP file?

The remaining portion of this section is the Research Team's response to the above questions. Included in this response is suggested recommendations to continue the analysis and evaluation of the UTPP type data.

Question 1: Why and what caused the research effort to fall short of the stated objective?

To answer this question, it is necessary to regress and reconsider the status of the 1970 UTPP file when the research began. The UTPP file represents the estimate of all one-way journey-to-work trips. It has been developed by the Bureau of Census by expanding the 15 percent sample data collected in the 1970 Census Instrument. Approximately forty-four percent of the trip interchanges are not coded at the destination end of

the work trip. These trips are coded to dummy zones which are zip codes, universal area codes, enumeration districts, or not allocated. It should be noted that the surrogate descriptions do not necessarily coincide with the 525 traffic analysis zones. Consequently, the first problem and a potential source of error is to synthetically distribute the uncoded UTPP trips to the 525 zone system. This procedure is discussed in the body of the report. Since the research is considered an effort to develop a methodology, the possible error resulting from the synthetic distribution of UTPP trips is not considered a significant prohibition.

The major reason for the research effort falls short of the objective is the dependence the research methodology has on other sources of data and models. The UTPP file is solely in terms of the journey-to-work travel. If it is desired to forecast all-purpose trips, it is necessary to develop a technique in which work trips are the predictor random variable. To develop all-purpose travel, the Research Team has used the GDOT/ARC 1972 origin-destination data as the base. All-purpose trip generation technique using a cross-classification technique has been used to predict productions. Similarily, a multiple regression model has been developed to estimate attractions. Both of these models use the half of one percent origin-destination study and both have been generated so that travel to work is a predictor variable.

With the reliance on other data, especially the origin-destination survey, the Research Team began questioning the validity of the proposed methodology. The Research Team has argued that it is questionable if the research effort should be continued as a worthwhile investigation.

Consider for a moment how the detailed work plan proposed to evaluate the research results. In Phase I of the project 265 volume count locations are reported. These data would have been compared to the synthetically assigned link volumes. The basic question is how does this evaluation shed any light in recognizing the significance of the research results? If the synthetic and ground counts compared favorably, it could be concluded that methodology is an acceptable procedure. If on the other hand, the comparison is not favorable, it could be concluded that the procedure is not the optimum methodology from which a peak-hour model can be derived. Either conclusion is perhaps correct or erroneous depending on the importance given the UPTT file. In the opinion of the Research Team, the significant dependence GDOT/ARC data and the origin-destination survey prevents a true evaluation of the methodology and UTPP file.

With the research methodology used in the project, the UTPP file is a secondary source that is directly dependent on the previously developed models and data. If this is the correct interpretation of the research results, the UTPP file is supplemental data that is not directly applicable in the transportation planning process. If the research methodology is used, origin-destination data are needed to calibrate models. The UTPP data cannot replace the need for this survey. It can be argued that if origin-destination data are collected, then these data should be collected so that the data can be useful in aggregate or disaggregate procedures not to use the UTPP data. It may not be economically consistent to collect two data sources when the origin-destination data will suffice for the traditional transportation process. If the

disaggregate techniques are used, then that procedure may not need an origin-destination survey.

It should be realized that the arguments put forth in this paper should not be interpreted nor should a conclusion be made to abandon the gathering of the journey-to-work information through the Census Instrument. The total usefulness of the UTPP file has not been researched and the conclusions are limited to the scope of the project and the research methodology employed. The UTPP file provides a wealth of information concerning the journey-to-work trip. The 1980 transportation related information will be obtained from a relatively large sample (16.7%). In addition, the work trip represents a large number of well defined trips usually occuring during the morning and evening peak hours. Perhaps a methodology can be developed that negates the need for an origin-destination survey or the UTPP file can be used directly in disaggregate procedures. These potential uses of the UTPP file require further research so that maximum utilization of the Census data can be achieved.

Question 2: Has the research effort been a waste of valuable resources in terms of manpower and dollars?

In the opinion of the Research Team, the answer to this question is a definite no. It is suggested that the research methodology utilized in this project is not the correct method. It points out to the other researchers that the reliance on other sources of data, especially on an origin-destination survey, is a duplication of data collection. It also suggests to other researchers the potential pit-falls and troublesome areas that exist in the UTPP data. Some of these areas, particularly the problem with geocoding, may be avoided in the 1980 Census reporting.

If the UTPP file from the 1980 Census is going to be used as a substitute for an origin-destination survey, then a methodology must be

developed that is not heavily dependent on an origin-destination study. This particular research did not meet this particular criterion. It is suggested that further research is mandated if the UTPP file can be used to its fullest potential.

Question 3: Can a peak-hour model be developed that is directly dependent on the UTPP file?

The answer to this question is: "perhaps". However, the research methodology, in the opinion of the Research Team, is not the optimum direction to take. As a supplement product, the research has led to the development of a Special Research Topic for a graduate student at Georgia Tech.

The goal of this special research effort is to develop a set of peak-hour factors that can be used at the by-purpose trip table stage. It is hypothesized that peak-hour factors at this level are more sensitive to actual peaking characteristics. It is anticipated that the factors can be used with the traditional transportation planning process. The special research is an on-going effort and a draft final report is projected for approximately on-month after the date of this report.

As an overall conclusion, it is recommended that further research be devoted to investigating the uses of the UTPP file. This is especially important because the 1980 UTPP file is expected to be more complete than its predecessor, the 1970 file. It may be an erroneous decision to wait until the 1980 UTPP file has been completed by the Bureau of Census to start the research for an adequate methodology. Proceeding with research in advance of the 1980 Census may assist in shedding sufficient knowledge so that the 1980 Census can be immediately used upon availability. Many urban areas will be in the process of updating their transportation plan at approximately the same time that the 1980 UTPP file becomes available.

If an appropriate forecasting procedure that uses the Census travel data can be found, this information could be a valuable source to the transport analyst.

APPENDIX

RESEARCH TEAM QUESTIONNAIRE LIST

During the project, the Research Team developed a questionnaire to survey the prevailing attitudes concerning the importance of the transportation questions in the 1980 Census Instrument. The list of individuals in the appendix are those who received a questionnaire.

INDIVIDUALS THAT RECEIVED A RESEARCH TEAM QUESTIONNAIRE

AGENCY: Georgia Department of Transportation

Mr. Hugh Tyner
Mr. Dick Graves
Mr. Lamar Caylar
Mr. Robert Seago
Mr. Emery Horvath
Mr. Oscar Roberts
Mr. Robert Bowling

AGENCY: Federal Highway Administration

Mr. Kevin Heanue
Mr. George Schdener
Mr. Constantino Ben
Mr. Glen Price
Mr. James Codley
Mr. Grover Bowman

AGENCY: Atlanta Regional Commission

Mr. Joel Stone
Mr. John Wilson

AGENCY: Bureau of the Census

Mr. Marshall Turner
Mr. Edward Elam

AGENCY: East-West Gateway Coordinating Council

Mr. Shoab Rana

AGENCY: Comsis Corporation

Mr. Martin Fertal

AGENCY: Metropolitan Washington Council of Governments

Mr. George Wickstrom

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DEVELOPMENT OF PEAK HOUR FACTORS FOR USE IN ATLANTA REGIONAL TRANSPORTATION PLANNING STUDIES

A SUPPLEMENT TO GDOT RP 7005-"Development of an Urban Peak Hour Traffic Model Based on a 1970 Census and Concurrent Ground Counts-Phase II"

by

J. Philip Boyd

Georgia Institute of Technology

August, 1978

SCEGIT-78-177

DEVELOPMENT OF PEAK HOUR FACTORS FOR USE IN ATLANTA REGIONAL TRANSPORTATION PLANNING STUDIES

APPROVED:

Dr. Donald O. Covault

Mr. M. John Moskaluk

Mr. John R. Wilson

ABSTRACT

Time-of-day analyses are used to analyze system requirements during critical time periods and, since the introduction of Transportation Systems Management (TSM) requirements, are becoming a more critical part of the overall transportation planning process. This research seeks to bring under one cover an evaluation of the 1972 Atlanta origin-destination survey data for peak hour travel and procedures to use traffic zone-analysis area-superdistrict equivalencies to allow the user to determine regional total vehicle peak hour trips or peak hour trips for particular highway facilities within a certain subarea.

Many researcher's have developed trip interchange peak hour models by developing a separate model for each internal trip purpose. This approach requires a large calibration dataset, and the results are often questionable due to survey difficulty in responding to time of travel questions for trip purposes other than work.

The author's approach is to provide a thorough evaluation of the work trip purpose to develop and forecast peak hour factors. This approach will provide a sound basis for an expansion to total peak travel and avoid marginal models that may be developed for other internal trip purposes. It is intended that this approach will provide greater compatibility for future limited surveys, such as the 1980 Census journey-to-work information.

ACKNOWLEDGMENTS

I would like to express my appreciation to the many individuals and agencies that have responded to my numerous requests for information, particularly the Atlanta Regional Commission, Mr. John Wilson, and the Georgia Department of Transportation, Mr. Herman Griffin and Mr. Donald Mills.

I would especially like to thank Dr. Donald Covault and Mr. John Moskaluk for suggesting the topic and providing the advice and encouragement necessary to accomplish the research

J. Philip Boyd

TABLE OF CONTENTS

SECTION I

INTRODUCTION

This report presents the methodology employed to develop peak hour factors for use in transportation planning models in the Atlanta region. There is an expressed interest in peak hour factor analysis by transportation planners at the Atlanta Regional Commission (ARC) and the Georgia Department of Transportation (GDOT). In the past, heavy emphasis has been placed on developing models for use in macro planning efforts such as simulation of average daily traffic (ADT) flows on regional transportation networks. However, many regional transportation plans are now adopted, including Atlanta's, and planning emphasis within transportation agencies is shifting toward application of design hour volume for use in micro or small area studies. Thus the importance of providing realistic peak hour traffic estimates for region plan implementation and facility design purposes is paramount

The standard methods of applying uniform factors to ADT assignment volumes to estimate peak hour travel do not adequately represent the variations in trip purpose and socio-economic characteristics of the trip maker. The objective of this special research problem has been to develop procedures which (1) allow more accurate examination of peaking characteristics in the Atlanta region, (2) analyze the effects of alternative land use and transportation improvements on these characteristics, and (3) project peak hour traffic volumes and levels of service.

The structure of the peak hour factors are designed to interface with currently adopted transportation models developed cooperatively by ARC, GDOT, and the Metropolitan Atlanta Rapid Transit Authority (MARTA). The 1972 Atlanta origin-destination survey data are analyzed to determine the distribution of trips within each ten minute time interval of the day through analysis of the trip start and arrive times. Peak hour factors developed from this analysis are further stratified by trip origin-destination characteristics, such as socio-economic characteristics of the trip maker, employment patterns, land use, etc. The peak hour factor forecasting procedure employs zonal socio-economic data that is forecast by the ARC Data Center.

The usefulness of this study is threefold:

1) The 1972 Atlanta origin-destination trip records, as well as socio-economic factors, are analyzed to determine peaking characteristics and current deficiencies in the survey data. Survey data deficiencies are identified so that survey designs for the next regional update can be improved.

2) The research provides a methodology and data base to develop and use peak hour factors that are easily understood and implemented by local planners.

3) The research provides a starting point in the Atlanta region for peak hour analysis and gives insight to the modeling complexities of peak hour travel. In this regard, refinements to the present Atlanta modeling structure can be identified to facilitate future peak hour planning models.

SECTION II

DETERMINATION OF PEAK HOUR FACTORS

The methodology to develop peak hour factors for transportation planning models adopted in the Atlanta region consists of (1) the analysis of the origin-destination trip surveys conducted in 1972, (2) evaluation of the Atlanta modeling sequence to determine the most appropriate structure and entry point for peak hour factors and (3) a model to predict future peak hour factors based on changes in regional socio-economic characteristics. The limitations of the various origin-destination trip data in developing peak hour factors is assessed from research findings during data processing and model analysis.

A. 1972 Atlanta Origin-Destination Study

The 1972 Atlanta origin-destination study consists of (1) a home interview survey for work, school, shopping, social-recreation and non-home based trips, (2) an external cordon roadside survey for internal-external, external-internal and external-external trips, and (3) a truck survey for truck trips. The study area, shown in Figure 1, includes Clayton, Cobb, Dekalb, Douglas, Fulton, and Gwinnett Counties, and the northernmost census tract of Henry County.

The 7 1/3 county area is divided into 525 traffic analysis zones and 52 external stations which are illustrated in Figure For analysis purposes the zones have been grouped into two aggregate systems.

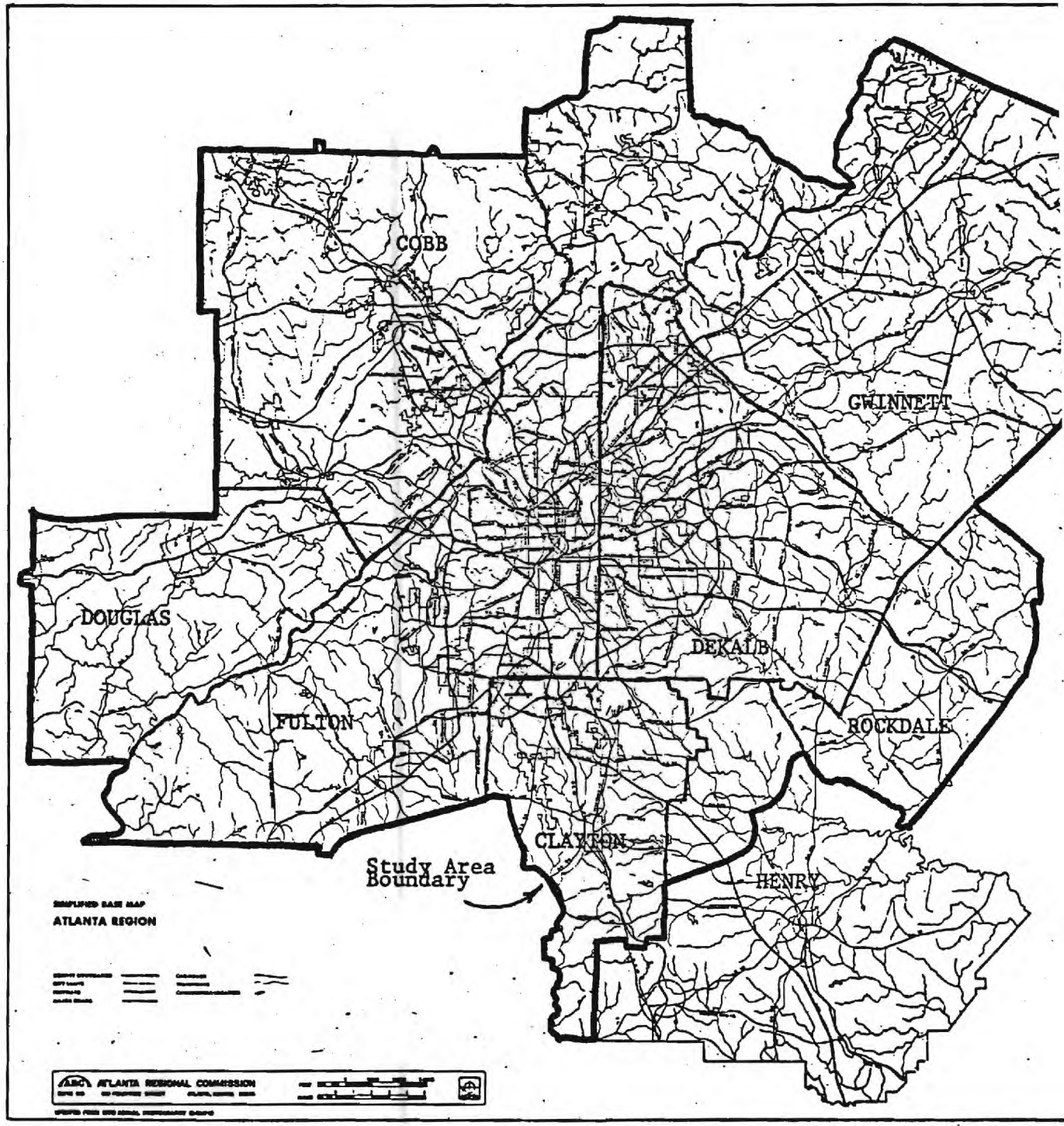


Figure 1. 1972 O-D Study Area

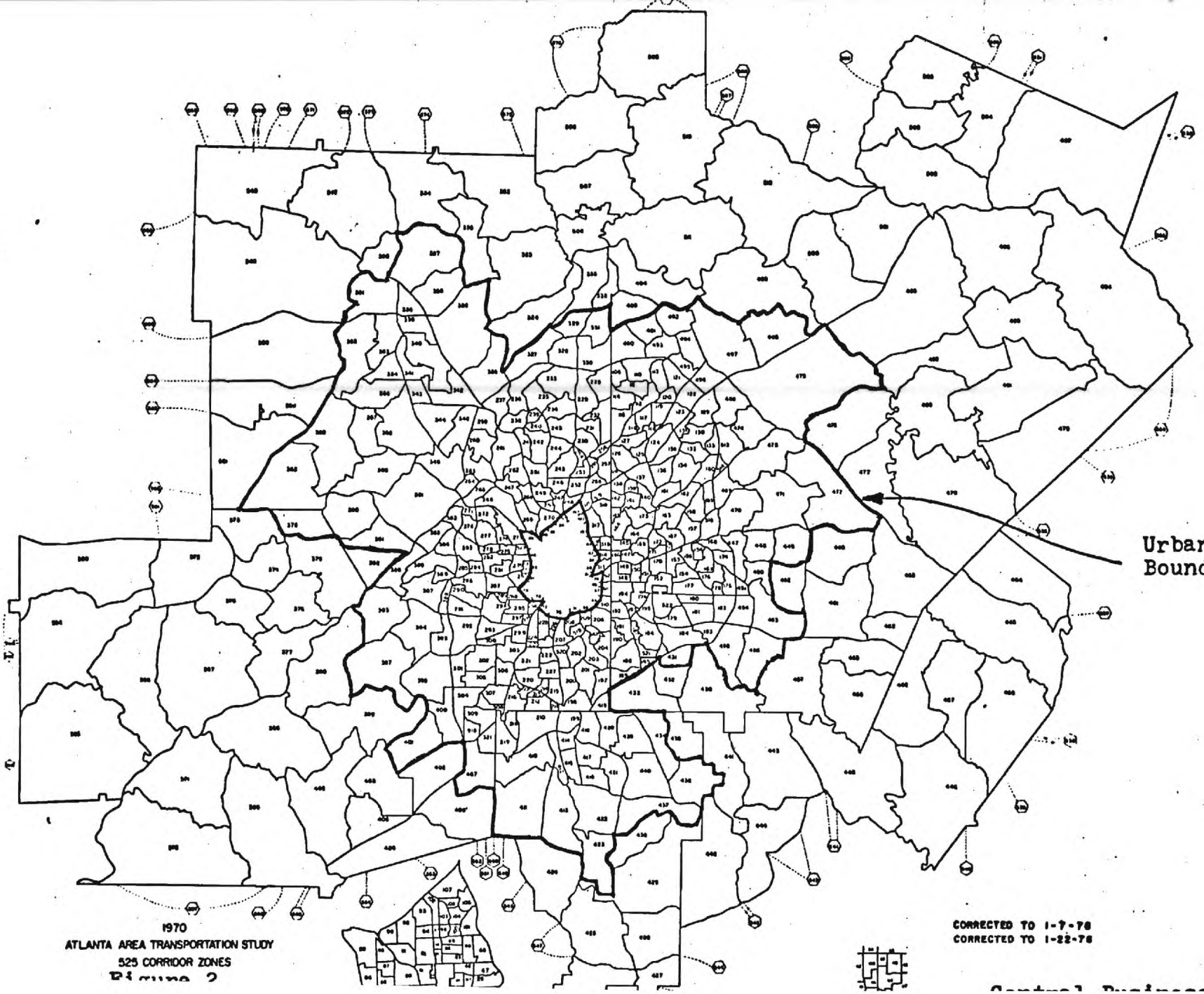


Figure 2

Central Business

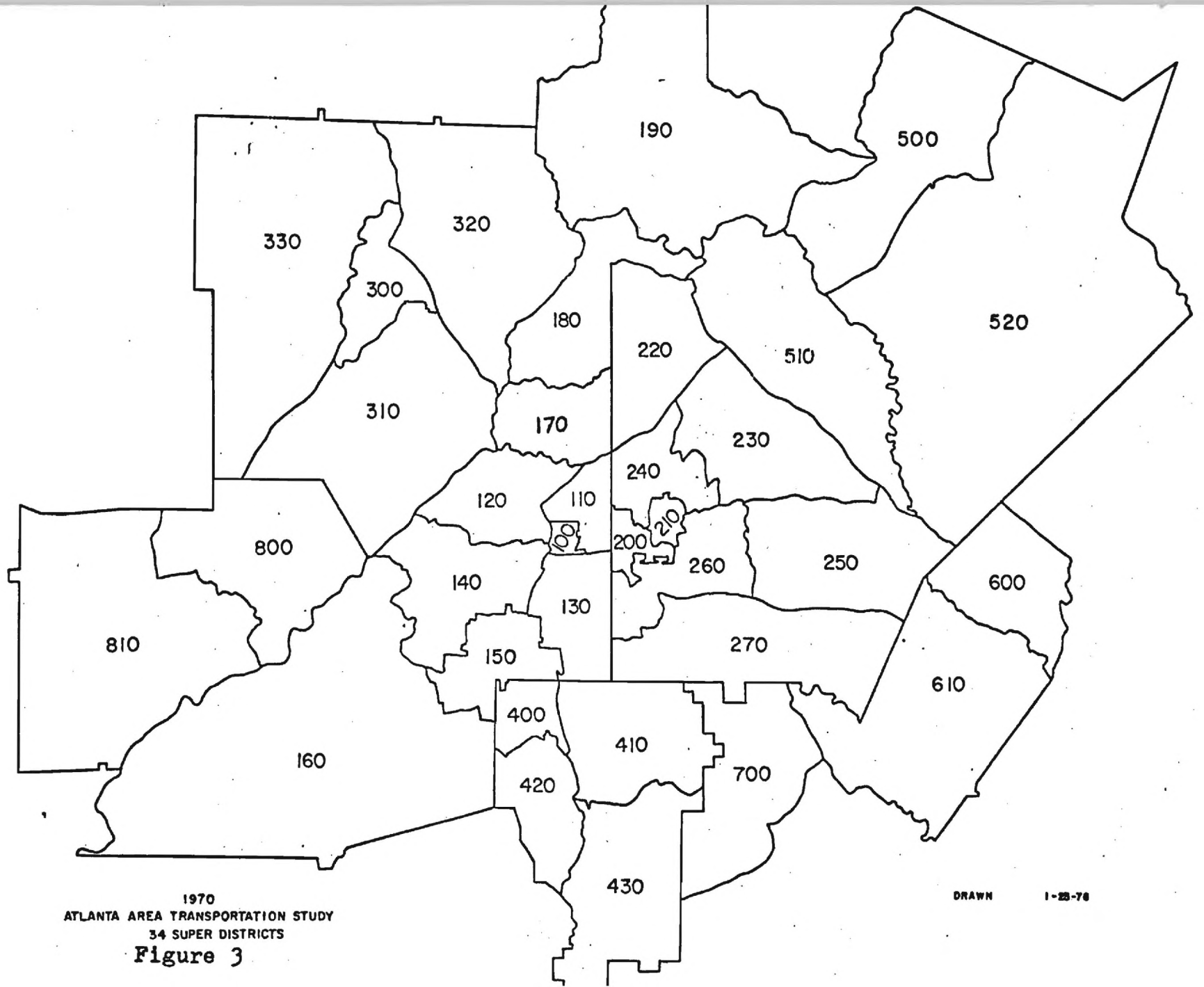
Again referring to Figure 2, one system has grouped the 525 z into four areas generally concentric about the center of the region. The four areas comprise (1) the central business district (CBD), (2) the CBD to the railroad cordon, (3) the railroad cordon to the urban area boundary, and (4) the urban area boundary to the study area boundary. The other system has aggregated the 525 zones to 34 analysis areas called superdistricts shown in Fiqure 3. Appendix A lists the traffic zones versus the four areas and 34 superdistricts.

The home interview survey gathered information on 2848 households which represented a 0.5 percent sample of all dwelling units within the region [3]. The socio-economic and trip data obtained in this survey were coded into standard Federal Highway Administration (FHWA) transportation planning Number 1 and 2 Card formats, respectively.

The external cordon roadside survey contains 69,240 interviews representing approximate sampling rates of 10 percent for freeways and 10 to 30 percent for other roads [3] The interview stations account for 95 percent of the traffic entering and leaving the region [3]. The interview data are coded in standard FHWA Number 3 Card format.

The truck survey contains 7,225 trip records representing a 4 percent sample for trucks $\geq$ 6000 lbs. and a 2 percent sam for trucks less than 6000 lbs. [3]. The trip data are coded into standard FHWA Number 4 Card format.

Appendix B contains the standard FHWA Number 1, 2, 3, an Card formats. The formats show the types of data obtained in the interviews and data locations for analysis of peak hour characteristics.



1970
ATLANTA AREA TRANSPORTATION STUDY
34 SUPER DISTRICTS
Figure 3

B. General Approach and PEAKHOUR Program Operation

The determination of peak hour factors begins by processing the survey trip records to evaluate when the peak hour occurs. The methodology used in this research problem identifies all trips that are in motion during the peak hour. The Federal Highway Administration (FHWA) program PEAKHOUR uses this concept to assess not only the time of the trip but also the duration of the trip by reading the start and arrive times of the survey trip record. The trip factor is added into a trips-in-motion table at each interval during which the trip takes place. The PEAKHOUR program has the option to divide the trip factor by two before adding it into the first and last time intervals. This option takes into account that on the average, a trip will only be in motion for one-half the beginning interval and one-half the ending interval. For example, assume the PEAKHOUR time period control parameter is set for analysis at 240 time intervals (24 hours at 6 minute intervals) and a trip record is read for a trip factor = 180 which begins at 7:45 and ends at 8:07. The trip factor would then be added to the five intervals as indicated below:

Intervals	Trip Factor
7:42-7:47	90
7:48-7:53	180
7:54-7:59	180
8:00-8:05	180
8:06-8:11	90

After all trip records are tabulated, the ten consecutive six minute intervals that contain the greatest number of trips are designated as the peak hour. The advantage of the trips-in-motion concept is that, by assessing both the start and arrive times, a more accurate determination of the peak period and trip duration is made, whereas a trip record analysis using only one point in time assumes that the trip occurs entirely for that hour period. Utilization of the trip duration in tabulating the trips produces a more realistic description of the nature of the peak period, i.e. short-highly congested versus long-moderately congested.

A typical PEAKHOUR program listing is included in Appendix C. Complete documentation of this program is found in Reference [9]. The program reads survey records containing, as a minimum, the trip factor (or number), start and arrive times, and from and to purposes. Other data items used in analysis of the Atlanta data include mode of travel, origin zone, and destination zone. The option to select varied trip purposes and zones makes the program well suited for special analysis, e.g. one could isolate and assess the peaking characteristics of shopping trips to a large regional shopping center.

The processing of the Atlanta trip data require setting PEAKHOUR control parameters as indicated:

PERIOD = 60-6 (default)
SCALE = 0.10

These values are required since the survey trip records have

start and arrive times coded at 0.1 hour (or 6 minute) increments and the number of trips is scaled in tenths. The Define card specifies the data locations of the input records. Specification varies by (1) criteria selected under varying analyses performed by the Select and Set cards and (2) by varying data positions on the Number 2, 3, and 4 cards.

The PEAKHOUR program output consists of three tables indicated below:

Table-1 A trip volume listing and printer plot showing the profile of trips-in-motion within 6 minutes from begin time.

Table-2 A trip volume listing and printer plot showing the profile of trips-in-motion within 60 minutes from begin time.

Table-3 Three matrices of peak hour factors for the three largest peak hours determined by the program. The matrices contain from home, to home, and non-home trips and respective peak hour factors and directional distribution.

In addition the printer plot profiles are represented by mathematical expressions which can be integrated to obtain the trip volume on the system between specified time limits. The Table-1 output is not needed in this study and is suppressed to reduce core requirements, run time, and printed output.

C. Analysis of Origin-Destination Surveys

1. Home Interview Survey Trip Records

The Number 2 card file contains 18,527 trip records with start and arrive times. These 18,527 trips have been expanded by GDOT to represent the regional trip table as indicated below:

Purpose	Total No. of Trips
Home Based Work	1,045,422
Home Based School	556,369
Home Based Shop	1,056,026
Home Based Social-Recreation	784,014
Non-Home Based	787,380
Total	4,229,211

Note: These trip totals represent a refined Number 2 card file (Spring, 1977) and differ from the trip totals documented on page 3-2 of Reference [3]. The refined file reflects upgradings in the GDOT accuracy check programs which edit and expand the survey data.

Initial investigation of the Number 2 card file determines peak hour information on person trips and auto driver trips, i.e. Mode = 1 (auto) and 8 (pickup truck and panel truck), for the five trip purposes. The person trip analysis revealed that 53 input records had errors in time and were deleted from processing while only 44 of the 53 input records were deleted when selecting the auto driver trip.

The distribution of total daily trips are as indicated in Table 1.

TABLE 1

TOTAL DAILY TRIPS

KEY: PERSON TRIPS
(AUTO DRIVER TRIPS)

	From Home	To Home
Work	543,731 (449,370)	499,681 (412,059)
School	295,740 (44,550)	260,287 (39,410)
Shop	448,833 (311,242)	488,022 (335,781)
Social-Recreation	381,579 (184,232)	400,137 (198,264)
Non Home Based	786,048 (531,846)	
Total	4,104,058 (2,106,754)	

The person trips and peak hour factors that are developed for the A.M. and P.M. peaks are given in Table 2. The auto driver trips and peak hour factors that are developed for the A.M. and P.M. peaks are given in Table 3. Directional distribution is denoted as D. The analysis shows that the A.M. peak hour occurs from 7:24 to 8:24 for both person and auto driver trips. However, the P.M. peak hour occurs from 3:12 to 4:12 for person trips and from 4:24 to 5:24 for auto driver trips. A comparison of Tables 2 and 3 shows the person trip A.M. peak as larger with 571,008 trips, while for auto driver trips the P.M. peak is larger with 323,548 trips. The shift in P.M. peak hour is caused by the school-home trip which includes school bus trips in the person trip tabulation.

TABLE 2 - PEAK PERSON TRIPS

TRIP PURPOSE	A.M. (7:24-8:24) TRIPS	PEAK FACTOR	D	P.M. (3:12-4:12) TRIPS	PEAK FACTOR	
Home - Work	260778	.250	.98	16203	.016	
Work - Home	6480	.006	.02	82761	.079	
Home - School	235459	.423	1.00	770	.001	
School - Home	313	.001	0	133253	.240	
Home - Shop	13315	.014	.91	49788	.053	
Shop - Home	1279	.001	.09	59039	.063	
Home - Soc/Rec	21931	.028	.91	24626	.032	
Soc/Rec - Home	2240	.003	.09	24389	.031	
Non Home Based	29213	.037	1.00	90130	.115	1
Total	571008			480959		

TABLE 3 - PEAK AUTO DRIVER TRIPS

TRIP PURPOSE	A.M. (7:24-8:24) TRIPS	PEAK FACTOR	D	P.M. (4:24-5:24) TRIPS	PEAK FACTOR	D
Home - Work	215917	.251	.98	8138	.009	.
Work - Home	5424	.006	.02	153830	.179	.
Home - School	22454	.267	1.00	1518	.018	.
School - Home	0	0	0	4665	.056	.
Home - Shop	9560	.015	.92	26458	.041	.
Shop - Home	821	.001	.08	46582	.072	.
Home - Soc/Rec	5176	.014	.83	11659	.030	.
Soc/Rec - Home	1039	.003	.17	15343	.040	.
Non Home Based	11834	.022	1.00	55355	.104	1.
Total	272225			323548		

The auto driver trip is further analyzed by aggregating the data to the three purposes used in the Atlanta mode choic model (home based work, home based other, and non home based trips). The peak hour characteristics were determined for th total region and for the four defined analysis areas. The pe hour characteristics by these purpose stratifications are giv in Table 4 for the total region and Table 5 for the four anal sis areas.

TABLE 4

PEAK AUTO DRIVER TRIPS - TOTAL REGION

TRIP PURPOSE	A.M. (7:24-8:24) TRIPS	PEAK FACTOR	D	P.M. (3:12-4:12) TRIPS	PEAK FACTOR	
Home - Work	215917	.251	.98	14783	.017	
Work - Home	5424	.006	.02	68641	.080	
Home - Other	37190	.033	.95	43816	.039	
Other - Home	1860	.002	.05	60848	.055	
Non Home Based	11834	.022	1.00	55272	.104	1
Total	272225			243360*		

*This total differs from the P.M. total trips of 323,548 in Table 3 since a different peak hour was generated due to the way the Select and Set cards were defined. However, the P.M. peak hour provides a direct comparison between Table 4 auto driver trips and Table 2 person trips. These comparisons on various peak hours and trip sets reveal the dynamics of the trips-in-motion concept and the subsequent shifts of the peak hour due to the universe of selected trips.

TABLE 5

PEAK AUTO DRIVER TRIPS

TRIP Purpose	A.M. PEAK TRIPS	A.M. PEAK FACTOR	D	P.M. PEAK TRIPS	P.M. PEAK FACTOR	D
CBD						
Home - Work	28986	.293	.95	641	.006	.
Work - Home	1613	.016	.05	19986	.202	.
Home - Other	4034	.077	.90	1368	.026	.
Other - Home	467	.009	.10	2917	.056	.
Non Home Based	6408	.104	1.00	7631	.124	1.
CBD to RR Cordon						
Home - Work	32311	.261	.99	358	.003	..
Work - Home	238	.002	.01	26197	.211	.
Home - Other	8052	.072	.95	2092	.019	.
Other - Home	382	.003	.05	6792	.060	.
Non Home Based[1]	6253	.069	1.00	9423	.104	1.
RR Cordon to Urban Area Boundary						
Home - Work	199355	.254	.97	7658	.010	.
Work - Home	5437	.007	.03	138732	.177	.
Home - Other	51358	.052	.79	34843	.035	.
Other - Home	13554	.014	.21	56658	.057	.
Non Home Based[2]	28953	.064	1.00	54316	.121	1.
Urban Area Boundary to Study Area Boundary						
Home - Work	47011	.271	.97	2078	.012	.
Work - Home	1586	.009	.03	32780	.189	.
Home - Other	12222	.060	.78	7243	.036	.
Other - Home	3539	.017	.22	14053	.069	.
Non Home Based[3]	7466	.101	1.00	8070	.109	1.

[1]Largest Peak occurs from 11:54 to 12:54 A.M. (14,993 trips, P.F. = .166)

[2]Largest Peak occurs from 11:54 to 12:54 A.M. (69,088 trips, P.F. = .154)

[3]Largest Peak occurs from 11:54 to 12:54 A.M. (13,390 trips, P.F. = .181)

The Table 5 peak hours are as indicated below:

Trip Purpose	A.M.	P.M.
Home Based Work	7:12- 8:12	4:24-5:24
Home Based Other	9:24-10:24	4:24-5:24
Non Home Based	9:24-10:24	3:54-4:54

2. External Cordon Roadside Survey Trip Records

The processing of the Number 3 card file reveals that it contains 69,041 trip records with the following total dail trips presented in Table 6. The overall limitation of the Number 3 card file is the lack of start and arrive times.

TABLE 6

TOTAL DAILY EXTERNAL TRIPS

	From Home	To Home	Non Home	Total
Internal - External	35051	56159	19227	110437
External - Internal	70160	27161	17710	115031
External - External	12674	12273	8098	33045
Total	117885	95593	45035	258513

Each trip record contains only the interview time at the external cordon station. Therefore, peak hour characteristics developed from this file do not represent actual peaking characteristics on the internal study area. The start and arrive time input positions on the Define card are both set equal to the interview time and the option to half-factor the two ending trip intervals is turned off to facilitate an initial run on the trip records. The printer plot of trips within 60 minutes of the interview points out another data limitation, i.e. the roadside survey was only conducted from 5:00 A.M. to 10:00 P.M.

Therefore peak hour factors that are developed from this file only reflect the peaking characteristics occurring at the external cordon and are biased by a 17 hour survey period rather than the 24 hours that are represented in the expanded trip file.

With the preceding caveats, the peak hour characteristics of this initial investigation are presented in Table 7.

TABLE 7

PEAK INTERNAL - EXTERNAL TRIPS

	A.M. (6:42-7:42)			P.M. (5:18-6:18)		
TYPE	TRIPS	PEAK FACTOR	D	TRIPS	PEAK FACTOR	D
From Home	4188	.046	.75	1647	.018	.13
To Home	1387	.015	.25	11054	.121	.87
Non Home	1270	.066	---	620	.032	---
External - Internal Trips						
From Home	15502	.159	.99	3682	.038	.42
To Home	170	.002	.01	5146	.053	.58
Non Home	781	.044	---	1308	.074	---
External - External Trips						
From Home	907	.036	.66	1490	.060	.53
To Home	457	.018	.34	1331	.053	.47
Non Home	580	.072	---	810	.100	---

3. Truck Survey Trip Records

The Number 4 card file that is used in this analysis only contains the 6872 internal truck trip records as discussed on page 7-2 of Reference [3]. These survey records have been expanded by GDOT to represent the regional truck trip table as indicated on the following page.

Purpose	Daily Truck Trips
From Home	53903
To Home	52815
Total Home Based	106718
Non Home Based	197415
Total Internal	304133

Note: These trip totals represent a refined Number 4 card file (Spring, 1977) and differ from the trip totals documented on page 7-2 of Reference [3]. The refined file reflects upgradings in the GDOT accuracy check programs which edit and expand the survey data.

The home end of the truck trip is defined as 'Base of Operations' in the trip purpose coding format. This convention requires setting the HOME parameter in PEAKHOUR equal to 5 (See Appendix B) to process the truck trip records.

The record processing reveals that 19 input records have errors in time and are deleted from the peak hour analysis. The peak hour characteristics for truck trips are presented in Table 8.

TABLE 8

PEAK TRUCK TRIPS

	A.M. (9:24-10:24)			P.M. (2:24-3:24)		
TYPE	TRIPS	PEAK FACTOR	D	TRIPS	PEAK FACTOR	D
From Home	10556	.099	.71	3356	.031	.32
To Home	4211	.039	.29	7222	.068	.68
Non Home[1]	25949	.131	---	10578	.126	---

[1]Largest Peak occurs from 10:54 to 11:54 A.M. (trips = 42435, P.F. = .163)

D. Evaluation of Atlanta Modeling Structure

The Atlanta regional transportation planning models are evaluated to determine the most appropriate structure and entry point for peak hour factors. The models are reviewed to allow the maximum use of currently adopted models and assign peak hour trips to the network.

With the emphasis toward developing a regional transportation plan in Atlanta the current Atlanta models assign ADT, or 24-hour volumes, to the highway network. A design hour factor matrix is then employed to convert the 24-hour assigned volumes to hourly peak period volumes for the purpose of computing volume/capacity ratios. The design hour factor matrix is derived from 1970 ground count data gathered by GDOT and the City of Atlanta and is classified by highway functional class and the four concentric analysis areas.

Major limitations of this approach are (1) the regional nature of the design hour volumes produced by uniform factors, i.e. zonal or small area peaking characteristics (socio-economic, land use, etc.) are not addressed, (2) variations in the peaking characteristics of individual trip purposes are not addressed, and (3) the difficulty in predicting future year changes in the design hour factors derived only on current year ground counts. Therefore, peak hour factors, such as those determined in Section II-C and applied to ADT non-directional trip tables for conversion to peak hour directional trip tables, will strengthen the Atlanta modeling effort by making peak hour forecasts that are more responsive to socio-economic and land use changes

at the origin and destination of the trip.

The alternative entry points for the peak hour factors derived from the internal trips (home interview survey) are (1) before the mode choice model or (2) after the mode choice model. The 'before mode choice' option will require factoring of the five person-trip purposes (home based work, home based school, home based shop, home based social-recreation and non home based) or, in an aggregate form, three person-trip purposes (home based work, home based other, and non home based). The 'after mode choice' trip table structure consists of auto person-trips and transit trips stratified by three purposes. The auto trip is subsequently stratified to auto driver and auto passenger trips.

The optimum entry point for peak hour factors is at the person-trip level before mode choice. Factoring at this point will develop the peak hour percentage of person-trips using any of the three major modes of travel-auto driver, auto passenger, and transit passenger and thus represents the period of the day when transit use and car-pooling are most evident. However, investigation of the Atlanta modeling structure reveals that the mode choice model is only calibrated for 24-hour trips. With this limitation the peak hour factors that are developed in this special research problem will concentrate on the auto driver trip derived after the mode choice process. Factored external and truck trip tables can then be added to the factored auto driver trip table to comprise the total vehicle peak hour trip table for assignment to the Atlanta highway network. The highway network

could require modifications to the capacity calculation assumptions, such as turning movements and signal splits, to reflect peak hour conditions. Traffic assignment computer programs will require minor modifications to effect a peak hour trip loading and capacity restraint.

E. Development of Peak Hour Factor Model

The peak hour factors developed in Section II-C are merely based on start and arrive times of the survey or base year trip records, and therefore it is difficult to predict shifts that will occur as system parameters change in future years. These system parameters include the socio-economic characteristics of the trip maker, shifting residential and employment patterns, congestion levels, and transportation improvements. Based on similar peak hour studies done in the Baltimore, Maryland region [4], the research attempts to incorporate future changes in peak hour travel based on changes in zonal socio-economic and land use characteristics. Peak hour travel is examined in terms of trip interchanges and associated trip interchange parameters, such as income, auto ownership, employment type, and geographical area, to determine if adequate estimates can be developed based on a knowledge of zonal characteristics.

In the Baltimore study, analysis to examine characteristics which may be significant in determining peak hour factors began with work travel. Income, residential density, and employment density were appended to the survey trip records to see if adequate relationships could be developed

based on a knowledge of characteristics at one end of the work trip. Tabulations were prepared for (1) work trip productions which showed peak period travel versus zonal income and zonal residential density and (2) work trip attractions which showed peak period travel versus zonal employment density. This analysis at one end of the trip indicated only a slight relationship to income and no other obvious correlations.

Investigation proceeded to analysis of the total trip interchange for the work trip. Trip interchange tabulations were prepared for median family income at the production end, employment density and industry type at the attraction end, and highway travel time for the trip. The analysis revealed a consistent variation by income within each industry type for the work trips tabulated in the Baltimore study.

The development of an Atlanta region peak hour factor model is focused on the auto driver work trip since the work trip purpose accounts for the largest portion of peak hour travel (refer to Table 3). Moreover, to complete the research within the time constraints and to avoid wrong approaches and insignificant zonal variables, the hypothesis, that the work trip is related to the tripmaker's income and occupation by industry type, is tested on the Atlanta trip data.

To analyze the auto driver work trip characteristics, the home interview survey income data from the Number 1 card file is appended to the trip data of the Number 2 card file by matching survey sample numbers. The computer program is listed in Appendix C. 'Analysis Trip Purpose' (column 62)

and 'CBD Analysis Code' (column 63) is replaced with 'Family Income Level' from the Number 1 card file in the updated Number 2 card file. The standard industrial classification (SIC) of the trip maker's employment is already contained on the Number 2 card file.

Income levels and industry classifications used in the origin-destination survey are compared and adjusted to provide compatibility with zonal income classes and employment by industry type used by the Atlanta Regional Commission (ARC) Data Center. This is necessary to link the individual trip record data to aggregate zonal parameters for application of the model in the base year and future year reflecting the zonal composition of income and industry type.

The income levels of the home interview origin-destination survey are given in the Number 1 card file in Appendix B. The zonal income data available from the ARC Data Center are categorized as follows [3]:

ARC Zonal Data Item	Income Level
8	Under $5000
9	$5000-$9999
10	$10,000-$14,999
11	$15,000-$24,999
12	$25,000 and up

Therefore, for data compatibility the Number 1 card file codes are aggregated as indicated:

Code	Income Level	ARC Zonal Data Item
00-04	Under $5000	8
05-09	$5000-$9999	9
10	$10,000-$14,999	10
11	$15,000-$24,999	11
12	$25,000 and up	12
13	Not Reported	--

The industry types in the home interview origin-destination survey are discussed in detail in Reference [6] and major categories are as listed below:

Code	O-D Survey Industry Type
0	Agriculture, Forestry, Fisheries, Mining
1	Construction
2	Manufacturing
3	Transport, Communication, and Public Utilities
4	Wholesale and Retail Trade
5	Finance, Insurance, Real Estate
6	Services
7	Public Administration (government)
8	Unknown or Unclassified, But in Labor Force
9	Not in Labor Force

The zonal employment by industry type available from the ARC Data Center are categorized as follows [3]:

ARC Item Number	Employment By Industry Type
42	Manufacturing, Transportation, Communications, Utilities, Mining
43	Wholesale and Retail Trade
46	Finance, Insurance, Real Estate, Services
47	Government
48	Construction

Therefore, for compatibility the ten origin-destination codes are aggregated to four analysis categories. For continuity, construction employment (48) is merged to manufacturing, transportation, communications utilities, and mining employment (42). To analyze the data, origin-destination codes 8 and will be retained. The industry groups and analysis codes are presented on the following page.

Code	Industry Type	ARC Item Number
0-3	Manufacturing, Transportation, Communications, Utilities, Mining, Construction	42,48
4	Wholesale and Retail Trade	43
5-6	Finance, Insurance, Real Estate, Services	46
7	Government	47
8	Unknown or Unclassified, But in Labor Force	--
9	Not in Labor Force	

The updated Number 2 card file is then analyzed using the FHWA program PRKTAB. The auto driver home based work trips are stratified by income level and industry type to compare the survey data distribution versus regional income and employment data available from ARC [2]. The industry type stratification compares favorably to regional employment categories. However, examination of the survey income data reveals a skewed distribution with poor comparison to ARC regional data. The PRKTAB computer listing and output are included in Appendix C. In summary, the distribution of income of the 3796 auto driver home based work survey records versus the ARC regional data is as indicated:

Income Level	1972 O-D Survey Data, (%)	ARC Census Data, (%)
Under $5000	6.0	16.3
$5000-$9999	44.2	29.7
$10,000-$14,999	6.8	28.4
$15,000-$24,999	5.9	19.8
$25,000 and up	37.1	5.8

To validate this income distribution, the entire Number 2 card file is analyzed but the distribution is found to closely resemble the auto driver trip file. Therefore, the survey income data is deemed unsatisfactory for use in the peak hour factor model.

As an economic indicator of the trip maker and substitute for income, the auto ownership survey data are selected. If the distribution of this data is satisfactory, relationships can be drawn from the number of autos owned by the trip maker and the industry in which he is employed. The number of households with 0 auto, 1 auto, 2 autos, and 3 or more autos per zone is available from ARC and will be used to relate the auto ownership survey data to the zonal level. The 'Number of Passenger Cars Owned' and 'Number of Other Vehicles Owned' data items from the Number 1 card file were summed and appended to the updated Number 2 card file. If the sum of vehicles owned was greater than three, the trip record auto ownership was set to three for stratification in the '3 or more' category. The auto ownership data replaces 'Park and Ride/Kiss and Ride' (column 64) in the second update of the Number 2 card file.

The new updated Number 2 card file is then analyzed for auto ownership distribution using PRKTAB. The distribution is examined for both the total trip file and auto driver home based work. The PRKTAB output for the total trip file is included in Appendix C. The trip records stratified by auto ownership reveal a more acceptable

distribution. The better distribution obtained by auto ownership over income is indicative of the fact that income level is often a poor response variable in a survey. Therefore, the auto ownership data will be used and the author will attempt to develop a peak hour factor forecasting model based on the trip maker's auto ownership and employment by industry type.

To develop base year peak hour factors for the auto driver home based work trip the updated Number 2 card file is analyzed by PEAKHOUR. Program runs in this research phase include:

(1) Auto Driver Home Based Work versus Auto Ownership and stratified by Industry Type

(2) Auto Driver Home Based Work versus 34 Superdistricts

Referring to Table 3, the percentages of auto driver peak hour trips by purpose are presented below.

Purpose	A.M.	P.M.
Home Based Work	81.3%	50.1%
Home Based Other	14.4%	32.8%
Non Home Based	4.3%	17.1%
Total Trips	272,225	323,548

To provide model input data, the A.M. peak hour is selected since the work trip is the largest, single trip purpose at this time period. A knowledge of the peaking characteristics of 81.3% of the travel will provide an excellent determinant of total peak hour travel. The A.M. peak hour factors stratified by auto ownership and industry type for the auto driver home based work trip are presented in Table 9 on the following page.

TABLE 9

A.M. PEAK HOUR FACTORS FOR

AUTO DRIVER HOME BASED WORK TRIPS

Auto Ownership = 1

Industry Type	From Home Peak Factor	D	To Home Peak Factor	D	Non-Directiona Peak Facto
0-3	.206	.93	.016	.07	.222
4	.199	.97	.006	.03	.205
5-6	.261	.97	.008	.03	.269
7	.233	.92	.019	.08	.252
	Auto Ownership = 2				
0-3	.225	.97	.008	.03	.233
4	.245	1.00	----	---	.245
5-6	.299	.98	.005	.02	.304
7	.302	.92	.026	.08	.328
	Auto Ownership = 3				
0-3	.265	.95	.013	.05	.278
4	.262	1.00	----	---	.262
5-6	.305	1.00	----	---	.305
7	.230	1.00	----	---	.230

Note: Empty cells occur where no survey data is available for the particular stratification.

The examination of the non-directional peak hour factors in Table 9 reveal that the peak hour percentages increase as the auto ownership increases for each industry type, except the government category. Using the origin-destination data for the home based work trip stratified by the trip maker's auto ownership level and employment type, the author proposes the following peak hour factor model for each trip maker.

$$K_{in} = f(O_a, I_n)$$

where K_{in} = the percentage of daily auto driver work trips produced in zone i by trip makers employed in industry n, occuring in the peak hour.

O_a = the auto ownership level of the trip maker.

I_n = the industry in which the trip maker is employed.

For application of the model, the structure is expanded to account for weighting, or averaging, of the zonal parameters when <u>all</u> auto driver work trips produced in zone i and attracted to zone j are addressed. The structure is

$$K_{ij} = \sum_a \left[\frac{H_{ai}}{\sum_a H_{ai}} \times \sum_n \left(\frac{I_{nj}}{\sum_n I_{nj}} \times k_{an} \right) \right]$$

where K_{ij} = the peak hour percentage of daily auto driver work trips produced in zone i and attracted to zone j.

H_{ai} = the no. of households with autos in zone i, a = 1, 2, or 3.

$\sum_a H_{ai}$ = the total no. of households with 1, 2, and 3 autos.

I_{nj} = the no. of persons employed in industry n in zone j.

$\sum_n I_{nj}$ = the total employment in zone j.

k_{an} = the percentage of peak hour trips made by trip makers with auto ownership level a and employed in industry n.

For explanation of the above model structure, the following example is presented. Assume there are two zones (zone i, the production (home) zone, and zone j, the attraction (work) zone) and that there are 1000 daily auto driver work trips produced in zone i and attracted in zone j. Assume the following zonal characteristics:

$I_{(4)_j}$ = wholesale and retail employment in zone j = 400

$I_{(5\text{-}6)_j}$ = finance, insurance, real estate, and services. employment in zone j = 235.

$I_{(0\text{-}3)_j} = I_{(7)_j}$ = other employment in zone j = 0.

H_{1i} = no. of households with 1 auto = 120.

H_{2i} = no. of households with 2 autos = 200.

H_{3i} = no. of households with 3+ autos = 50.

From Table 9 the k_{an} factors are:

Industry Type	Auto Ownership 1	2	3
(4)	.205	.245	.262
(5-6)	.269	.304	.305

Therefore, $\sum_a H_{ai} = 120 + 200 + 50 = 370$

$$\sum_n I_{nj} = 400 + 235 + 0 = 635$$

For auto ownership level = 1:

$$\frac{120}{370}\left[\left(\frac{400}{635}\right)(.205) + \left(\frac{235}{635}\right)(.269)\right] = .074$$

For auto ownership level = 2:

$$\frac{200}{370}\left[\left(\frac{400}{635}\right)(.245) + \left(\frac{235}{635}\right)(.304)\right] = .144$$

For auto ownership level = 3:

$$\frac{50}{370}\left[\left(\frac{400}{635}\right)(.262) + \left(\frac{235}{635}\right)(.305)\right] = .038$$

Finally, $K_{ij} = \sum_a = .074 + .144 + .038 = .256$ and the number of home based work auto driver trips in the A.M. peak hour is 1000 X .256 = 256 trips.

Applying the proposed model to the Atlanta zonal data for (1) number of households by auto ownership and (2) employment types will produce a 525 X 525 cell matrix of peak hour factors for the work trip. The Atlanta 24-hour auto

driver home based work trip matrix can then be multiplied to the generated factor matrix to produce a matrix of peak hour auto driver home based work trips.

In an attempt to further stratify the peak hour factor, the PEAKHOUR runs for auto driver home based work versus the 34 Atlanta superdistricts are evaluated. The superdistrict stratification shows A.M. peak hour factors ranging from 0.21 to 0.30 and P.M. peak hour factors ranging from 0.16 to 0.27. Upon grouping the factors by freeway corridor, no relationships could by established. Furthermore, the number of trip records for many of the superdistricts is insufficient to establish reliable correlations to geographic orientation. Therefore, the author feels that the proposed form should not be stratified by superdistricts since the calibration dataset is sparse in many superdistricts and may produce unreliable peak hour factors.

The next step in the development of a peak hour model is to expand from the auto driver work trip factor to a total vehicle trip factor capability. One approach is to develop peak hour factor models for the remaining trip purposes. However, it is likely that future origin-destination travel surveys will only address the journey-to-work trip as a matter of economics. A 1975-76 survey of travel to work in Atlanta has already been conducted as a supplement to the U.S. Bureau of Census Annual Housing Survey and the journey-to-work question will also be asked in the 1980 Census. Furthermore, the current U.S. Department of Transportation positio

is that these travel to work surveys will be the only ones supported and no funding will be available for large-scale, multi-purpose trip surveys.

The author proposes to apply a generalized factor technique to estimate peak hour total vehicle trips. Recalling that home based work auto driver trips account for 81.3% of the A.M. peak hour, the work purpose peak hour trip matrix, derived on page 29, should provide a reliable estimate of of the work trip peaking characteristics so that a total travel factor can be applied. The author uses factors which are found in the Quick Response Manual, Reference [14], and are developed from Reference [1] and the 1972 National Personal Transportation Study. The Quick Response Manual contains tables which cross-relate home based work auto driver trips to total internal auto driver trips. The user should be aware of time period definitions and inherent subtleties in the tables, such as the fact that the work trip peak generally occurs in the A.M. period while the total travel peak hour generally occurs during the P.M. peak period. Thus the tables are structured to yield the true peak volume occuring in a 24-hour period. Therefore, from Table 45 in Reference [14], the developed Atlanta peak hour home based work auto driver trip matrix is multiplied by 2.059 to yield peak hour total internal auto driver trips.

For many types of analysis only internal auto driver trips may be needed. However, for corridors where external-en and truck trips are significant, a factor of 1.3, from Figure 8 of Reference [14], may be applied to the total internal auto

driver trips to yield total vehicle trips in the peak hour. Hopefully, limited resources will be available to survey external-ended and truck trips to supplement the 1980 Census journey-to-work trips and thus offer an alternative approach to this latter factor.

Recalling the example on pages 30-31, the number of peak hour auto driver work trips = 256. To summarize the factoring process for peak hour trips for interchange i-j:

total internal auto driver trips = 256 X 2.059 = 527, and

total vehicle trips = 527 X 1.3 = 685.

SECTION III

SUMMARY

A. Results

This research has resulted in a thorough analysis of the 1972 Atlanta origin-destination trip surveys to determine time-of-day characteristics, an evaluation of Atlanta regional transportation models to determine the appropriate peak hour factor structure, and the development of a peak hour factor model for auto driver home based work trips. The research has attempted to provide a starting point for transportation planners in the Atlanta region in developing peak hour traffic volumes for sub-area analysis and pertinent issues requiring peak hour considerations, such as air quality studies.

The investigation of the origin-destination time-of-day characteristics gives insight into the variability of peak hour travel. The PEAKHOUR program runs on the Number 2 cards reveal peak hour variation between person trips and auto driver trips. Also when stratified by the four analysis areas and 34 superdistricts, different peak hours are generated pointing out varying times in sub-areas of the region.

The Number 3 card analysis identifies the need (1) to code both the trip start and arrive times and (2) to survey external-ended trips for the entire 24-hour period. The trip interview time is inappropriate for analysis since it only gives the peaking characteristics at the external cordon. The Number 4 card analysis yields peak hour percentages for

truck trips that can be applied to develop peak hour truck trips. However, the largest peak hour for truck trips occurs from 10:54 to 11:54 A.M., adding yet another peak hour time period to the analysis.

The peak hour factors and trips, presented in Section II, provide the transportation planner with an understanding of individual purpose peaking variations that can be readily used. For special analysis applications, the user is referred to (1) the PEAKHOUR program in Appendix C and (2) zonal, analysis area, and superdistrict definitions in Figures 2 and 3 and Appendix A. With these resources the user can provide peak hour factors for any of the internal trip purposes and truck trips for any defined sub-area. For example, the user can isolate and analyze peak hour shopping trips to a major regional shopping center.

If the Number 3 card data contained start and arrive times, (1) the internal auto driver trip records, (2) the external trip records, and (3) the truck trip records could be merged to form the total vehicle trip table. The PEAKHOUR program could then be run to determine the aggregate peak hour and appropriate peak hour factors for specified purpose sets. However, the author's approach is to provide a thorough analysis of the work trip to establish peak hour factors for the largest component of total travel. This approach should provide a reliable estimate of the peaking characteristics due to the repetitive nature of the work trip. The forecast variables of number of households by auto ownership and employment by type should reflect sound trip maker characteristics

for future year estimates. Furthermore, in view of limited origin-destination travel surveys in the future, the work trip may provide the only calibration dataset. The generalized factors in Reference [14] provide a good approach to yield total internal auto driver trips and total vehicle trips, based on travel by time of day from numerous urbanized area studies.

B. Conclusions

The investigation of origin-destination data concludes that current survey deficiencies in the Number 3 card file make it unusable in developing peak hour factors for external-ended trips. The author concludes that the current Atlanta mode choice model is calibrated only for 24-hour trips and thus limits peak hour factoring to the auto driver trip after mode choice. The required substitution of trip maker auto ownership for income level will maintain a reliable estimate of the trip maker peaking characteristics since auto ownership is highly correlated to income. Overall, the author concludes that the research provides procedures to develop and use peak hour factors for use in Atlanta transportation planning studies

C. Recommendations

The external cordon roadside survey should be conducted for 24 hours and should ask the trip maker for trip start and arrive times when the survey is performed for the next regional update. In addition, quality control mechanisms should be established to assure that good data, such as income level, is received when any origin-destination surveys are conducted.

A traffic assignment of the peak hour total vehicle trip table (derived from the procedures specified in Section III-E) is recommended to test the model adequacy if the GDOT Atlanta System Planning Branch can provide an adequate number of peak hour ground counts in the region for comparison. Study designs to determine data collection requirements for the next regional update should address (1) travel surveys that can supplement the 1980 Census journey-to-work information and (2) a system of ground count stations which will provide peak hour volumes on a continuing basis.

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APPENDIX A

1. 525 TRAFFIC ZONES BY ANALYSIS AREAS
2. 34 SUPERDISTRICTS BY ARC MAP NUMBER
3. 525 TRAFFIC ZONES BY 34 SUPERDISTRICTS

1. 525 TRAFFIC ZONES BY ANALYSIS AREA

AREA	TRAFFIC ZONES
Central Business District (CBD)	1-22, 24-26, 32, 43-45, 62, 108
CBD to Railroad Cordon	23, 27-31, 33-42, 46-61, 63-107, 516, 517, 525
Railroad Cordon to Urban Area Boundary	108-321, 325-331, 336-346, 351-357, 360, 362, 378, 380-391, 393-395, 397, 398, 400, 401, 407, 410-423, 431, 434, 436, 437, 439, 440, 447-451, 453-456, 469-475, 488, 490-498, 513, 514, 515, 518, 524
Urban Area Boundary to Study Area Boundary	322-324, 332-335, 347-350, 358, 359, 361, 363-377, 379, 392, 396, 399, 402-406, 408, 409, 424-430, 432, 433, 435, 438, 441-446, 452, 457-468, 476-487, 489, 499-512

2. 34 SUPERDISTRICTS BY ARC MAP NUMBER

	SUPERDISTRICT NAME	ARC MAP NUMBER
1.	CBD-Atlanta	100
2.	N.E. Atlanta	110
3.	N.W. Atlanta	120
4.	S.E. Atlanta	130
5.	S.W. Atlanta	140
6.	Tri-Cities	150
7.	South Fulton	160
8.	Buckhead	170
9.	Sandy Springs	180
10.	North Fulton	190
11.	Atlanta (Dekalb)	200
12.	Decatur	210
13.	Chamblee	220
14.	N.E. Dekalb	230
15.	N.W. Dekalb	240
16.	S.E. Dekalb	250
17.	S.W. Dekalb	260
18.	South Dekalb	270
19.	Marietta	300
20.	South Cobb	310
21.	North Cobb	320
22.	N.W. Cobb	330
23.	Airport	400
24.	N.E. Clayton	410
25.	Riverdale	420
26.	South Clayton	430
27.	Buford	500
28.	S.W. Gwinnett	510
29.	Lawrenceville	520
30.	North Rockdale	600
31.	South Rockdale	610
32.	North Henry	700
33.	East Douglas	800
34.	West Douglas	810

3. 525 TRAFFIC ZONES BY 34 SUPERDISTRICTS

```
SET   SD 1
ZONES=1-14,18-26,33,37,41-45,62,108,516

SET   SD 2
ZONES=15-17,27-32,46-48,61,63-66,90-107,312-320,517

SET   SD 3
ZONES=39,40,59,60,83-89,247-250,265-279,281-284,382-384,523,524

SET   SD 4
ZONES=34,35,49-54,67-77,197,198,200-209,222-227,310,311,419,519,520,525

SET   SD 5
ZONES=36,38,55-58,78-82,280,285-301,365-369,394,395,398

SET   SD 6
ZONES=211-217,220,221,302-309,321,400,518

SET   SD 7
ZONES=368-371,393,396,397,399,401-403,405-409

SET   SD 8
ZONES=230-232,238-246,251-258,261,262

SET   SD 9
ZONES=228,229,233-236,327-333,404

SET   SD 10
ZONES=506-512

SET   SD 11
ZONES=143,145-152,193,194

SET   SD 12
ZONES=153,166,167,170-172

SET   SD 13
ZONES=109-128,489-496

SET   SD 14
ZONES=129-134,159,160,469-474,488,513,514

SET   SD 15
ZONES=135-142,144,157,158,161-165,173,515

SET   SD 16
ZONES=448-450,452,453,460-463

SET   SD 17
ZONES=154-156,168,169,174-182,186-188,190-192,195,196,447,451,454,521
CONTINUE,522

SET   SD 18
ZONES=183-185,189,430-433,455-459

SET   SD 19
ZONES=336,339,350-353

SET   SD 20
ZONES=259,260,263,264,340-346,354-357,360,362,380,381,390-392

SET   SD 21
ZONES=237,322-326,334,335,337,338

SET   SD 22
ZONES=347-349,358,359,361

SET   SD 23
ZONES=210,218,219,410,412

SET   SD 24
ZONES=199,414-418,420-422,434-437,439,440

SET   SD 25
ZONES=411,413,424

SET   SD 26
ZONES=423,425-429,438

SET   SD 27
ZONES=500-505

SET   SD 28
ZONES=475-477,497-499

SET   SD 29
ZONES=478-487

SET   SD 30
ZONES=464,465

SET   SD 31
ZONES=445,446,466-468

SET   SD 32
ZONES=441-444

SET   SD 33
ZONES=372-379

SET   SD 34
```

APPENDIX B

FHWA STANDARD

NUMBER 1, 2, 3, & 4

CARD FORMATS

1972
STANDARD FORMAT
CARD TYPE 1
BASIC HOUSEHOLD INFORMATION

CARD COLUMN	ITEM	POSSIBLE CODE NUMB AND REMARKS
1	Card type	1 (always)
2-6	Census Tract Number	
7-10	Census or Survey Block No.	
11-13	Sample Number	
14-18	O & D Subzone Number	Residence Subzone (1548 format)
19	Sample Type	1-Housing Unit 2-Group Quarter
20	Structure Type	0-Other (specify) 1-Single Housing-De 2-Single Housing-At 3-Apartments 3 or 4 4-Apartments 5 to 1 5-Apartments 20 or 6-Rooming House or Dormitory 7-Hotel 8-Motel 9-Rest Home or Institution
21-22	Date of Travel (month)	01-12
23	Date of Travel (day of week)	2-Mon., 3-Tues., 4- 5-Thurs., 6-Fri.

CARD COLUMN	ITEM	POSSIBLE CODE NUMB AND REMARKS
24	Number of Passenger Cars Owned	0-9
25	Number of Other Vehicles Owned	0-9
26	Type of Other Vehicles Owned	2-Pickups, Panels 3-Taxis, 4-Trucks
27-28	Total Persons Living at Address	01-99
29-30	Persons 5 Years & Over Living at Address	1-99
31	Visitors at This Address	0-9
32-33	Potential Drivers (16 yrs. and Older)	1-99
34-35	Duration of Occupancy for Head of Household (Years)	00-99
36-37	Duration of Occupancy for Head of Household (Months)	00-11
38	Sex & Race Head of Household	1-White Male 2-White Female 3-Non-White Male 4-Non-White Female
39-42	Land Use as Found at This Address	1100-9900 See Standard Land U Coding Manual (Janu 1965 for more det
43-44	Total Trips Reported (exclude walk)	00-99

CARD COLUMN	ITEM	POSSIBLE CODE NUMBE AND REMARKS
45-46	Auto Driver Trips Reported	00-99
47-48	Number of Persons 5 Years and Older Making Trips (exclude walk)	00-99
49-50	Number of Persons 5 Years and Older Making No Trips	00-99
51	Number of Persons 5 Years and Older With Trips Unknown	0-9
52	Housing-Unit Control	0-Had Trips 1-Had No Trips 2-Vacant 3-Demolished 4-Commercial 5-Does Not Exist As Specified 6-Refused to Answer 7-Contagious Disease 8-Out of Town
53-54	Family Income Level	00-Under $1000 01-$1000-$1999 02-$2000-$2999 03-$3000-$3999 04-$4000-$4999 05-$5000-$5999 06-$6000-$6999 07-$7000-$7999 08-$8000-$8999 09-$9000-$9999 10-$10,000-$14,999 11-$15,000-$24,999 12-$25,000 and Over 13-Not Reported
55-66	Not Used	Not Used
67-70	Housing Unit Expansion Factor	XXX.X
71-74	Trip Expansion Factor	XXX.X

CARD COLUMN	ITEM	POSSIBLE CODE NUMB AND REMARKS
75-77	Residence Centroid	
78-80	Study Code	352 (always)

1972
STANDARD FORMAT
CARD TYPE 2
PERSON TRIP INFORMATION

CARD COLUMN	ITEM	POSSIBLE CODE NUMB AND REMARKS
1	Card Type	2 (always)
2-6	Census Tract Number	001.00-099.99 Atlanta (Fulton 100.00-199.99 Other Fulton Co. 200.00-208.99 Atlanta (DeKalb 209.00-299.99 Other DeKalb Co. 300.00-399.99 Cobb Co. 400.00-499.99 Clayton Co. 500.00-599.99 Gwinnett Co. 600.00-699.99 Rockdale Co. 700.00-799.99 Henry Co. 800.00-899.99 Douglas Co.
7-10	Census or Survey Block Number	
11-13	Sample Number	001-999
14-18	Residence Zone	0001-8994
19-20	Date of Travel (month)	01-12
21	Date of Travel (day of week)	2-Mon., 3-Tues., 4- 5-Thurs., 6-Fri.

CARD COLUMN	ITEM	POSSIBLE CODE NUMBI AND REMARKS
22-23	Person Number	01-89 Resident 91-99 Visitor
24	Person-Sex & Race	1-White Male 2-White Female 3-Non-White Male 4-Non-White Female
25-26	Occupation	01,02,03,04,05,06, 11,12,13,21,22,23, 31,32,33,41,42,43,4 45,51,52,61,62,71,7 73,74,75,76,81,82,8 84,85,86,87,88
27-28	Industry	01,02,10,21,22,31,3 41,42,51,52,53,61,6 64,70,81,82,90
29-30	Trip Number	01-99
31-35	1548 Traffic Zones (Origin) or National Codes	0001-8994 Internal 9000-69,999 Externa
36-40	1548 Traffic Zones (Destination) or National Codes	Same as above item
41	Mode of Travel	0-Unknown Mode 1-Auto Driver 2-Auto Passenger 3-Bus-Transit 4-Taxi-Passenger 5-Truck Passenger 6-Walk to Work 7-School Bus 8-Truck Driver (Pic or panel only) 9-Other mode

CARD COLUMN	ITEM	POSSIBLE CODE NUMB AND REMARKS
42-43	Time of Start (hour)	00-23
44	Time of Start (minutes)	Code: Minutes 0: 0-6 1: 6-12 2: 12-18 3: 18-24 4: 24-30 5: 30-36 6: 36-42 7: 42-48 8: 48-54 9: 54-60
45-46	Time of Arrival (hour)	00-23
47	Time of Arrival (minutes)	Same as Time of Sta (minutes)
48	Trip Purpose (from)	0-Home 1-Work 2-Personal Business 3-Medical-Dental 4-School 5-Social-Recreation 6-Change Travel Mode 7-Eat Meal 8-Shopping 9-Serve Passenger
49	Trip Purpose (to)	Same as above item
50-53	Land Use at Origin	1100-9900 See Standard Land U Coding Manual (Jan. for more detail.
54-57	Land Use at Destination	Same as above item

CARD COLUMN	ITEM	POSSIBLE CODE NUMB AND REMARKS
58	Car Pool	1-Yes, 2-No
59	Kind of Parking at Origin	0-Did Not Park 1-Street Free 2-Street Meter 3-Lot Free 4-Lot Paid 5-Garage Free 6-Garage Paid 7-Service or Repair 8-Residential Prope 9-Cruised
60	Kind of Parking at Destination	Same as above item
61	Number of Persons in Car	1-9
62	Analysis Trip Purpose	1-Home Based Work 2-Home Based Shop 3-Home Based School 4-Home Based Social Recreation 5-Non-Home Based
63	CBD Analysis Code	1-Destination in CBI 2-Origin in CBD 3-Both Origin and D Destination in CBI
64	Park and Ride/Kiss and Ride (Only if Mode is 3)	0-Single Modal Tran Trip 1-Park and Ride Tra Trip 2-Kiss and Ride Tra Trip
65-68	Trip Expansion Factor	XXX.X

CARD COLUMN	ITEM	POSSIBLE CODE NUMBE AND REMARKS
69-71	Residence Centroid	001-525 Internal Centroid
72-74	Origin Centroid	001-525 Internal Centroid 526-577 External Centroid
75-77	Destination Centroid	001-525 Internal Centroid 526-577 External Centroid
78-80	Study Code	352 (Always)

1972
STANDARD FORMAT
CARD TYPE 3
EXTERNAL TRIP INFORMATION

CARD COLUMN	ITEM	POSSIBLE CODE NUMBI AND REMARKS
1	Card Type	3 (Always)
2-5	Atlanta Region Number	0610 (Always)
6-9	Station Number (Interview made at)	(0001-0052)
10-11	Date (month)	01-12
12	Date (day of week)	2-Mon., 3-Tues., 4-W 5-Thurs., 6-Fri.
13	Direction of Travel	1-Inbound 2-Outbound
14-17	Serial Number	Numbering of the Interviews
18	Vehicle Type	0-Passenger Car 1-Pick-up or Panel 2-2Axle, Single Tire 3-2Axle, Dual Tire 4-3Axle, Single Unit 5-Bus 6-Taxi 7-3Axle Combination 8-4Axle Combination 9-5Axle Combination
19	Number of Persons in Vehicle	1-9
20-24	1548 Traffic Zones (Origin) or National Codes	00001-08994 09000-69,999

CARD COLUMN	ITEM	POSSIBLE CODE NUMB AND REMARKS
25-28	Land Use at Origin	1100-9900 (See Stan Land Use Coding Man Jan. 1965 - for mor detail)
29-33	1548 Traffic Zones (Destination) or National Codes	00001-08994 09000-69,999
34-37	Land Use at Destination	Same as for Land Us Origin
38	Trip Purpose (from)	0-Home 1-Work 2-Personal Business 3-Medical, Dental 4-School 5-Social-Recreation 6-Change Mode of Tra 7-Eat Meal 8-Shopping 9-Serve Passenger
39	Trip Purpose (to)	Same as above item
40	Passenger Car Garaged or Truck Registered	1-Inside Cordon 2-Outside Cordon at 3-Outside Cordon at Destination 4-Outside Cordon - 5-Inside Cordon at 6-Inside Cordon at Destination
41-44	Station of Entrance of Through Trips	0001-0052
45-48	Station of Exit of Through Trips	0001-0052
49	Not Used	

CARD COLUMN	ITEM	POSSIBLE CODE NUMBI AND REMARKS
50-53	Intermediate Stop Location	0000-8994
54-57	Intermediate Stop Land Use	1100-9900 (See Stanc Land Use Coding Manu Jan. 1965 - for more detail)
58	Intermediate Stop Trip Purpose	0-Gas or Oil 1-Work 2-Personal Business 3-Overnight 4-School 5-Social-Recreation 6-Change Mode of Tra 7-Eat Meal 8-Shopping 9-Serve Passenger
59-60	Time Interview Complete (hour)	00-23
61	Time Interview Complete (minutes)	Code / Minutes 0 / 0-6 1 / 6-12 2 / 12-18 3 / 18-24 4 / 24-30 5 / 30-36 6 / 36-42 7 / 42-48 8 / 48-54 9 / 54-60
62-65	Hour Expansion Factor	XXX.X
66-70	24-Hour Expansion Factor	XXXX.X
71	Not Used	
72-74	Origin Centroid	001-525 Internal Cer 526-577 External Cer

CARD COLUMN	ITEM	POSSIBLE CODE NUMBE AND REMARKS
75-77	Destination Centroid	001-525 Internal Cent 526-577 External Cent
78-80	Survey City Code	352 (Always)

1972
STANDARD FORMAT
CARD TYPE 4
TRUCK TRIP INFORMATION

CARD COLUMN	ITEM	POSSIBLE CODE NUMBE AND REMARKS
1	Card Type	4-Trucks (Always)
2-5	Sample Number	0001-9999
6	Licensed Capacity	1-CA-CZ/RA-RZ SA-SZ/TA-TZ 2-WA-WZ 3-YA-XZ 4-PA/PB/PX 5-PC-PE/PY 6-PF/HF 7-PG/HG 8-PH/HH 9-PI/HI 0-PJ/HJ X-PK/HK Y-FA/FZ Z-EA/EZ M-City C-County S-State F-Federal
7-8	Date (month)	01-12 When Factor Control is 0 Blank When Factor C is 2, 3, or 4
9	Date (date of week)	2-Mon., 3-Tues., 4-W 5-Thurs., 6-Fri. Blank When Factor C is 2, 3, or 4

CARD COLUMN	ITEM	POSSIBLE CODE NUMBE AND REMARKS
10	Vehicle Type	2-Less than 10,000 l 5-10,001-14,000 lbs. 6-14,001-24,000 lbs. 7-24,001-36,000 lbs. 8-36,001-Maximum Blank When Factor C is 2, 3, or 4
11-12	Vehicle Year	00-99 Blank When Factor C is 2, 3, or 4
13-17	Garaging Address Residence Zone	00000-08900 Blank When Factor C is 2, 3, or 4
18-21	Land Use at Garaging Address	1100-9900 (See Stand Land Use Manual for detail) Blank When Factor C is 2, 3, or 4
22-23	Owner's Industry	OX, OY, 00-09 Blank When Factor C is 2, 3, or 4
24-25	Owner's Business	00-08, 10-35, 39-72, 74-83, 90, 95 Blank When Factor C is 2, 3, or 4
26-28	Total Trips Reported	001-999 Blank When Factor C is 2, 3, or 4
29-31	Total Daily Mileage	001-999 Blank When Factor C is 2, 3, or 4

CARD COLUMN	ITEM	POSSIBLE CODE NUMBE AND REMARKS
32	Factor Control	0-Good interview wit trips reported 1-Good interview wit trips 2-Out of service, mo out of area, or ga out of area 3-No travel data ava junked, sold out o could not locate 4-Personal Use
33-35	Trip Number	001-999
36-40	Trip Origin (subzone)	Internal-00000-08999 External-09000 or gre Codes are found in th Numerical Codes for States, Counties, and Cities of the United States
41-45	Trip Destination	Same as above item
46-47	Time of Start (hour)	00-23
48	Time of Start (minutes)	Code / Minutes 0 / 0-6 1 / 6-12 2 / 12-18 3 / 18-24 4 / 24-30 5 / 30-36 6 / 36-42 7 / 42-48 8 / 48-54 9 / 54-60
49-50	Time of Arrival (hour)	00-23

CARD COLUMN	ITEM	POSSIBLE CODE NUMBE AND REMARKS
51	Time of Arrival (minutes)	Same as Time of Star (minutes)
52-53	Trip Length (miles)	00-99
54	Trip Purpose (from)	1- Pick-up Goods 2- Deliver Goods 3- Pick-up & Deliver Goods 4- Service 5- Base of Operation 6- Personal Business
55	Trip Purpose (to)	Same as above item
56-59	Land Use at Origin	Same as Land Use at Garaging Address
60-63	Land Use at Destination	Same as above item
64	Persons in Vehicle	1-9
65-67	Expansion Factor	XX.X
68-70	Residence Centroid	Varies with study ar
71-73	Origin Centroid	Same as above item
74-76	Destination Centroid	Same as Residence Ce
77	Blank	Not Used
78-80	Survey City Code	Varies with study ar

APPENDIX C

1. TYPICAL PEAKHOUR COMPUTER PROGRAM LISTING AND SELECTED OUTPUT

2. NUMBER 2 CARD ANALYSIS WITH TRIP MAKER'S INCOME APPENDED

3. NUMBER 2 CARD ANALYSIS WITH TRIP MAKER'S AUTO OWNERSHIP APPENDED

1. TYPICAL PEAKHOUR COMPUTER PROGRAM LISTING AND SELECTED OUTPUT

```
//BOYDPH JOB (30320604012,XXXXXX,XXXX),JPB,TIME=4
//*MAIN LINES=16
//*BOYDPH  ************************************************
//*BOYDPH                    REPLY U TO CENG11
//*BOYDPH  ************************************************
//JOBLIB DD DSN=HP.APLANPAC,UNIT=3330,VOL=SER=CENG11,DISP=S
//FACT  EXEC  PGM=PEAKHOUR,REGION=128K
//SYSOUT DD SYSOUT=A
//EBCDIC DD DISP=(OLD,KEEP),UNIT=3330,VOL=SER=CENG11,
//    DSN=HP.A2CRDS.AUTOWN
//SYSIN DD *
PAR,SCALE=0.10,NOTABLE1
DEFINE,FACTOR=65-68,MODE=41,STTIME=42-44,ARRTIME=45-47
DEFINE,FROMPURP=48,TOPURP=49,IND=27,AUTO=64
SELECT HBWORK AUTO DRIVER AUTO OWNERSHIP=1
MODE=1,8,PURPOSES=1,AUTO=1
SET,IND=0-3
SET,IND=4
SET,IND=5-6
SET,IND=7
GO
//FACT  EXEC  PGM=PEAKHOUR,REGION=128K
//SYSOUT DD SYSOUT=A
//EBCDIC DD DISP=(OLD,KEEP),UNIT=3330,VOL=SER=CENG11,
//    DSN=HP.A2CRDS.AUTOWN
//SYSIN DD *
PAR,SCALE=0.10,NOTABLE1
DEFINE,FACTOR=65-68,MODE=41,STTIME=42-44,ARRTIME=45-47
DEFINE,FROMPURP=48,TOPURP=49,IND=27,AUTO=64
SELECT HBWORK AUTO DRIVER AUTO OWNERSHIP=2
MODE=1,8,PURPOSES=1,AUTO=2
SET,IND=0-3
SET,IND=4
SET,IND=5-6
SET,IND=7
GO
//FACT  EXEC  PGM=PEAKHOUR,REGION=128K
//SYSOUT DD SYSOUT=A
//EBCDIC DD DISP=(OLD,KEEP),UNIT=3330,VOL=SER=CENG11,
//    DSN=HP.A2CRDS.AUTOWN
//SYSIN DD *
PAR,SCALE=0.10,NOTABLE1
DEFINE,FACTOR=65-68,MODE=41,STTIME=42-44,ARRTIME=45-47
DEFINE,FROMPURP=48,TOPURP=49,IND=27,AUTO=64
SELECT HBWORK AUTO DRIVER AUTO OWNERSHIP=3
MODE=1,8,PURPOSES=1,AUTO=3
SET,IND=0-3
SET,IND=4
SET,IND=5-6
SET,IND=7
```

PRINTER PLOT FOR AUTO DRIVER HOME BASED WORK TRIPS

AT AUTO OWNERSHIP LEVEL=1 AND INDUSTRY CATEGORIES 0-3

IS PRESENTED ON NEXT 5 PAGES.

TABLE-2 TRIPS WITHIN 60 MIN. FROM BEGIN TIME FOR (01) SET.IND=0-3

BEGIN HH.MM	FROM HOME	TO HOME	NON-HOME	SET TOTAL	DAILY TOTAL	PCT/SET= 0 5.92 4700 11.84 9400 17.76 14100 23.68 18800 29.60 23500 35.52 28200 41.44 32900 47.36 37600
0.00	0	3,073	0	3,073	3,313	.$$$$$$D
0.06	0	3,073	0	3,073	3,456	.$$$$$$D
0.12	0	2,965	0	2,965	3,491	.$$$$$$D
0.18	0	2,856	0	2,856	3,263	.$$$$$$D
0.24	0	2,758	0	2,758	3,046	.$$$$$D
0.30	0	2,362	0	2,362	2,650	.$$$$SD
0.36	0	1,960	0	1,960	2,340	.$$$$SD
0.42	0	1,572	0	1,572	2,045	.$$SD
0.48	0	1,159	0	1,159	1,633	.$SD
0.54	0	1,031	0	1,031	1,505	.$SD
1.00	0	723	0	723	1,197	.$SD
1.06	0	415	0	415	963	.SD
1.12	0	415	0	415	1,037	.SD
1.18	0	415	0	415	1,111	.SD
1.24	0	318	0	318	1,088	.SD
1.30	0	221	0	221	910	.=D
1.36	0	221	125	346	955	.SD
1.42	0	111	251	362	970	.SD
1.48	0	0	251	251	766	.SD
1.54	0	0	376	376	798	.SD
2.00	0	0	502	502	924	.SD
2.06	0	0	502	502	1,156	.SD
2.12	0	0	502	502	1,251	.S=D
2.18	93	0	502	595	1,409	.S=D
2.24	186	0	502	688	1,704	.S==D
2.30	186	0	376	562	1,505	.S=D
2.36	186	0	251	437	1,494	.S=D
2.42	186	0	251	437	1,683	.S==D
2.48	186	0	251	437	1,811	.S==D
2.54	186	0	126	312	1,814	.S==D
3.00	186	0	0	186	1,689	.===D
3.06	186	117	0	303	1,806	.S==D
3.12	186	235	0	421	1,691	.S==D
3.18	186	235	0	421	1,459	.S=D
3.24	186	235	0	421	1,459	.S=D
3.30	186	235	0	421	1,351	.S=D
3.36	186	235	0	421	1,243	.S=D
3.42	186	235	0	421	1,243	.S=D
3.48	186	235	0	421	1,335	.S=D
3.54	186	235	0	421	1,427	.S=D
4.00	93	235	0	328	922	.SD
4.06	97	235	0	332	841	.SD
4.12	194	235	0	429	1,263	.S=D
4.18	194	117	0	311	1,347	.S=D
4.24	194	0	0	194	1,557	.==D
4.30	194	0	0	194	1,776	.===D
4.36	529	0	0	529	2,523	.S===D

TABLE-2 TRIPS WITHIN 60 MIN. FROM BEGIN TIME FOR (01) SET,IND=0-3

BEGIN HR.MM	FROM HOME	TO HOME	NON-HOME	SET TOTAL	DAILY TOTAL	PCT/SET= 5.92 11.84 17.76 23.68 29.60 35.52 41.44 47.36 0 4700 9400 14100 18800 23500 28200 32900 37600
4.54	863	0	0	863	3,282	.$S====D
5.00	863	0	0	863	3,295	.$S====D
5.06	1,178	92	0	1,270	4,156	.$$S=====D
5.12	1,493	185	0	1,678	5,009	.$$FS======D
5.18	1,758	185	0	1,943	5,475	.$$$S=======D
5.24	2,023	185	0	2,208	5,948	.$$$FS=======D
5.30	1,926	185	0	2,111	5,778	.$$$$=======D
5.36	3,390	185	0	3,575	8,583	.$$$$$$FS=========D
5.42	5,267	185	0	5,452	11,971	.$$$$$$$$$$FS==========D
5.48	6,310	185	0	6,495	13,878	.$$$$$$$$$$$$FS==========D
5.54	7,262	185	0	7,447	15,717	.$$$$$$$$$$$$$$FS==========D
6.00	7,362	185	0	7,547	15,844	.$$$$$$$$$$$$$$$$S==========D
6.06	9,128	662	0	9,790	20,165	.T$$$$$$$$$$$$$$$$$$F$$==========D
6.12	11,486	1,140	0	12,626	25,363	.$T$$$$$$$$$$$$$$$$$$$$$$$$$F$$S==========D
6.18	12,396	1,140	0	13,536	27,451	.$T$$$$$$$$$$$$$$$$$$$$$$$$$$$F$$S==========D
6.24	13,161	1,140	0	14,301	29,730	.$T$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$$S==========D
6.30	13,247	1,047	0	14,294	30,030	.$T$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$$S==========D
6.36	14,457	955	0	15,412	33,509	.$T$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$S==========D
6.42	15,064	955	0	16,019	37,168	.$T$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$S==========D
6.48	14,148	955	136	15,239	37,709	.$T$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$S==========C
6.54	14,228	955	272	15,455	38,771	.NT$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$S==========D
7.00	13,445	955	272	14,672	37,271	.NTT$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$S==========D
7.06	12,563	955	272	13,790	38,752	.NT$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$S==========D
7.12	12,214	955	272	13,441	41,198	.NT$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$$S==========D
7.18	11,869	946	272	12,987	40,623	.NT$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$F$$S==========D
7.24	11,547	611	272	12,430	39,817	.N$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$FS==========D
7.30	10,419	242	272	10,933	36,281	.N$$$$$$$$$$$$$$$$$$$$$FS==========D
7.36	9,176	0	408	9,584	34,529	.N$$$$$$$$$$$$$$$$$$$$$S==========D
7.42	7,656	0	543	8,199	33,514	.N$$$$$$$$$$$$$$$$$FS==========D
7.48	6,552	0	543	7,095	30,947	.N$$$$$$$$$$$$$$$FS==========D
7.54	6,125	0	543	6,668	29,604	.N$$$$$$$$$$$$FS==========D
8.00	4,718	0	408	5,126	25,574	.N$$$$$$$$$FS==========D
8.06	3,766	0	272	4,038	22,036	.N$$$$$$FS==========D
8.12	3,542	0	272	3,814	20,619	.N$$$$$$S==========D
8.18	2,869	0	361	3,230	18,216	.N$$$$FS==========D
8.24	2,450	0	585	3,035	16,757	.N$$$FS==========D
8.30	2,014	0	721	2,735	14,325	.NF$$==========D
8.36	1,855	286	585	2,726	12,792	.N$$F$$==========D
8.42	1,609	571	449	2,629	12,147	.N$F$$==========D
8.48	1,161	571	449	2,181	10,691	.NF$$S==========D
8.54	1,161	571	538	2,270	10,433	.NF$$S==========D
9.00	1,161	571	627	2,359	8,554	.NF$$S==========D
9.06	1,073	665	763	2,501	7,167	.TN$$S=========D
9.12	908	760	899	2,567	7,262	.$N$$S=========D
9.18	833	760	1,013	2,606	7,058	.$N$$S=========D
9.24	833	760	941	2,584	7,109	.$N$$S=========D
9.30	726	760	767	2,253	6,565	.$N$$S=========D
9.36	958	760	777	2,495	7,126	.$N$$S=========D
9.42	1,296	760	876	2,932	7,934	.$NF$$S==========D

TABLE-2 TRIPS WITHIN 60 MIN. FROM BEGIN TIME FOR (01) SET.IND=0-3

BEGIN HH.MM	FROM HOME	TO HOME	NON-HOME	SET TOTAL	DAILY TOTAL	PCT/SET= 5.92 11.84 17.76 23.68 29.60 35.52 41.44 47.36
						0 4700 9400 14100 18800 23500 28200 32900 37600
9.48	1,086	760	1,012	2,858	7,856	.$N$$$S==========D
9.54	875	760	1,256	2,891	8,328	.$TN$$$S==========D
10.00	776	760	1,229	2,765	8,231	.$TN$$$S==========D
10.06	677	760	1,004	2,441	7,744	.FN$$$S==========D
10.12	677	760	916	2,353	7,889	.FN$$$S==========D
10.18	677	760	916	2,353	8,060	.FN$$$S==========D
10.24	677	760	916	2,353	8,451	.FN$$$S==========D
10.30	532	380	916	1,828	7,534	.TN$$$S==========D
10.36	387	117	1,541	2,045	7,847	.F$$$S==========D
10.42	290	235	2,259	2,784	9,322	.T$$$NS==========D
10.48	193	235	2,233	2,661	9,199	.T$$$NS==========D
10.54	193	235	2,114	2,542	8,962	.T$$NS==========D
11.00	97	235	1,901	2,233	8,233	.T$$NS==========D
11.06	0	563	2,182	2,745	9,895	.T$$$N$==========D
11.12	0	891	2,778	3,669	12,206	.$T$$TN$S==========D
11.18	0	891	2,880	3,771	12,531	.$T$$$N$S==========D
11.24	0	891	3,146	4,037	13,068	.$T$$$$N$S==========D
11.30	0	891	3,306	4,197	12,878	.$T$$$$N$S==========D
11.36	117	876	3,153	4,146	13,214	.$T$$$$N$S==========D
11.42	235	861	3,013	4,109	14,013	.FT$$$N$$S==========D
11.48	235	861	3,046	4,142	14,166	.FT$$$N$$S==========D
11.54	235	861	3,172	4,268	14,416	.FT$$$$N$S==========D
12.00	235	861	2,667	3,763	13,100	.FT$$$N$S==========D
12.06	444	963	2,676	4,083	13,491	.FT$$$N$$S==========D
12.12	654	1,066	3,212	4,932	14,328	.FT$$$$N$$S==========D
12.18	654	957	3,246	4,857	13,240	.FT$$$$N$$S==========D
12.24	654	849	3,122	4,625	13,075	.FT$$$$N$$S==========D
12.30	654	849	2,712	4,215	12,102	.FT$$$N$$S==========D
12.36	754	945	2,579	4,278	12,188	.$T$$N$$$S==========D
12.42	853	1,041	2,721	4,615	12,788	.$T$$$N$$$S==========D
12.48	956	1,138	2,721	4,815	12,899	.$T$$$N$$$S==========D
12.54	1,058	1,235	2,721	5,014	13,599	.$FT$$N$$$$S==========D
13.00	1,058	1,040	2,209	4,307	12,349	.$T$$N$$$S==========D
13.06	1,286	845	1,767	3,898	11,940	.$TFN$$$S==========D
13.12	1,430	615	1,973	4,018	12,713	.TFN$$$S==========D
13.18	1,455	386	2,237	4,078	13,047	.TF$N$$$S==========D
13.24	1,564	386	2,251	4,201	13,608	.TF$N$$$S==========D
13.30	1,438	386	1,661	3,485	12,716	.TFN$$S==========D
13.36	1,532	290	1,629	3,451	13,430	.TFN$$$S==========D
13.42	1,752	193	2,073	4,018	14,649	.$$$N$$$$S==========D
13.48	2,263	306	2,205	4,774	15,055	.T$$$N$$$$S==========D
13.54	2,774	419	2,337	5,530	15,852	.T$$$NF$$$$$S==========D
14.00	2,454	322	2,209	4,985	14,255	.T$$$N$$$$$S==========D
14.06	2,327	899	2,312	5,538	14,388	.$T$$N$$$$$$S==========D
14.12	2,518	1,573	2,544	6,635	16,160	.$$T$N$$$$$$$S==========D
14.18	2,388	1,651	2,658	6,697	16,906	.$$$TFN$$$$$$S==========D
14.24	2,257	1,730	2,508	6,495	17,817	.$$$TN$$$$$$$S==========D
14.30	2,149	1,730	2,013	5,892	16,396	.$$$NF$$$$$$S==========D

TABLE-2 TRIPS WITHIN 60 MIN. FROM BEGIN TIME FOR (01) SET.IND=0-3

BEGIN HH.MM	FROM HOME	TO HOME	NON-HOME	SET TOTAL	DAILY TOTAL	PCT/SET= 0 4700	5.92 9400	11.84 14100	17.76 18800	23.68 23500	29.60 28200	35.52 32900	41.44 37600	47.36
14.42	2,634	3,449	1,860	7,943	21,150	.$$$N$FT$$$$$$$$$$S==========D								
14.48	2,537	3,815	1,630	7,982	20,537	.$$N$F$$T$$$$$$$$$S==========D								
14.54	2,440	4,160	1,489	8,109	20,344	.$$N$F$$$T$$$$$$$$S==========D								
15.00	2,174	4,157	1,580	7,911	18,841	.$$N$F$$$T$$$$$$$$S==========D								
15.06	1,767	4,698	1,692	8,157	20,521	.$$$N$$$$T$$$$$$$$S==========D								
15.12	1,516	4,921	1,804	8,241	22,718	.$$FN$$$$$T$$$$$$$$S==========D								
15.18	1,421	4,666	2,229	8,316	23,027	.$$F$N$$$$T$$$$$$$$S==========D								
15.24	1,437	4,800	2,540	8,777	24,432	.$$F$N$$$$T$$$$$$$$$S==========D								
15.30	1,335	4,705	2,230	8,274	23,138	.$$F$N$$$T$$$$$$$$S==========D								
15.36	1,242	6,043	2,465	9,750	26,012	.$$F$N$$$$$$T$$$$$$$$S==========D								
15.42	1,133	7,368	3,032	11,533	29,889	.$F$$$N$$$$$$$$$T$$$$$$$$S==========D								
15.48	1,024	8,187	3,143	12,354	30,130	.$F$$$$N$$$$$$$$$T$$$$$$$$S==========D								
15.54	1,024	9,265	3,079	13,368	30,844	.$F$$$$N$$$$$$$$$$T$$$$$$$$S==========D								
16.00	715	8,936	2,950	12,601	28,996	.$F$$$N$$$$$$$$$$T$$$$$$$$S==========D								
16.06	524	10,044	3,067	13,635	32,772	.F$$$$N$$$$$$$$$$$T$$$$$$$S==========D								
16.12	644	11,477	3,161	15,282	37,819	.F$$$$$N$$$$$$$$$$$$T$$$$$$$$S==========D								
16.18	644	11,874	3,049	15,567	38,431	.F$$$$$N$$$$$$$$$$$$$T$$$$$$$S==========D								
16.24	534	12,266	2,956	15,756	39,432	.F$$$$N$$$$$$$$$$$$$$$T$$$$$$$S==========D								
16.30	424	11,639	2,529	14,592	37,747	.F$$$N$$$$$$$$$$$$$$$T$$$$$$S==========D								
16.36	424	11,425	2,201	14,050	37,532	.F$$$N$$$$$$$$$$$$$$$T$$$$$S==========D								
16.42	331	11,284	2,206	13,821	37,861	.F$$$N$$$$$$$$$$$$$$$T$$$$S==========D								
16.48	239	10,401	2,334	12,974	37,070	.F$$$N$$$$$$$$$$$$$$$T$$$$$S==========D								
16.54	239	10,071	2,319	12,629	37,336	.F$$$N$$$$$$$$$$$$$$$T$$$$$S==========D								
17.00	239	8,488	1,894	10,621	33,690	.F$$$N$$$$$$$$$$$$$$T$$$$S==========D								
17.06	239	6,883	1,662	8,784	30,434	.F$$N$$$$$$$$$$$$$T$$$$S==========D								
17.12	119	6,856	1,405	8,380	29,404	.$$N$$$$$$$$$$$$T$$$S==========D								
17.18	0	6,641	962	7,603	27,700	.$N$$$$$$$$$$$$T$$S==========D								
17.24	0	6,542	826	7,368	27,467	.$N$$$$$$$$$$$$T$$S==========D								
17.30	0	5,235	826	6,061	23,285	.$N$$$$$$$$$$T$$S==========D								
17.36	0	4,034	956	4,990	19,859	.$N$$$$$$T$$S==========D								
17.42	0	3,926	1,086	5,012	19,174	.$N$$$$$T$$$S==========D								
17.48	0	3,383	1,086	4,469	16,700	.$N$$$$T$$$S==========D								
17.54	0	3,054	1,086	4,140	15,344	.$N$$$T$$$S==========D								
18.00	0	2,583	986	3,569	12,392	.$N$$T$$S==========D								
18.06	117	2,165	780	3,062	9,992	.$N$$T$$S==========D								
18.12	235	2,217	545	2,997	9,650	.N$$$TS==========D								
18.18	235	2,217	546	2,998	9,274	.N$$$TS==========D								
18.24	235	2,115	676	3,026	9,336	.N$$$TS==========D								
18.30	235	1,667	468	2,370	7,806	.N$$TS==========D								
18.36	235	1,340	544	2,119	6,805	.N$TS=========D								
18.42	235	1,360	828	2,423	7,125	.FNT$S==========D								
18.48	339	1,360	828	2,527	7,361	.FNT$S==========D								
18.54	443	1,360	828	2,631	7,675	.FNT$$S==========D								
19.00	443	1,215	828	2,486	6,671	.FNT$S=========D								
19.06	443	1,070	828	2,341	5,897	.FN$$S=======D								
19.12	443	850	828	2,121	5,820	.FN$$S======D								
19.18	326	648	699	1,673	5,285	.N$$S======D								
19.24	209	666	569	1,444	4,913	.N$S======D								
19.30	209	569	569	1,347	4,275	.N$S=====D								

TABLE-2 TRIPS WITHIN 60 MIN. FROM BEGIN TIME FOR (01) SET.IND=0-3

BEGIN HH.MM	FROM HOME	TO HOME	NON-HOME	SET TOTAL	DAILY TOTAL	PCT/SET= 5.92 11.84 17.76 23.68 29.60 35.52 41.44 47.36
						0 4700 9400 14100 18800 23500 28200 32900 37600
19.36	209	473	597	1,279	3,986	.N$S====D .
19.42	209	473	625	1,307	4,003	.N$S=====D.
19.48	209	473	469	1,151	3,402	.NS=====D
19.54	209	473	313	995	2,991	.NS===D
20.00	104	346	469	919	2,611	.NS===D
20.06	0	329	625	954	2,639	.NS===D
20.12	0	437	625	1,062	3,056	.NS====D
20.18	0	437	625	1,062	3,156	.NS====D
20.24	0	437	625	1,062	3,376	.NS====D
20.30	0	327	625	952	3,167	.NS====D
20.36	0	217	625	842	3,331	.NS====D
20.42	0	217	469	686	3,402	.S=====D
20.48	0	217	313	530	2,974	.S====D
20.54	0	217	313	530	2,974	.S====D
21.00	0	217	313	530	2,974	.S====D
21.06	209	217	249	675	3,439	.S=====D
21.12	418	109	185	712	3,697	.FS=====D
21.18	418	104	185	707	3,694	.FS=====D
21.24	418	209	311	938	3,928	.NS=====D
21.30	418	209	436	1,063	3,861	.NS=====D
21.36	527	301	563	1,391	4,028	.N$S=====D.
21.42	635	394	690	1,719	4,266	.N$$S====D.
21.48	635	394	690	1,719	4,216	.N$$S====D.
21.54	635	394	690	1,719	4,350	.N$$S====D.
22.00	635	394	690	1,719	4,042	.N$$S====D.
22.06	635	965	690	2,290	4,251	.NT$$S===D.
22.12	635	1,635	690	2,960	4,848	.N$T$$S===D
22.18	635	1,889	690	3,214	5,084	.N$$T$$S===D
22.24	635	2,046	564	3,245	5,208	.N$$T$$S===D
22.30	426	1,941	439	2,806	4,758	.N$$T$$S===D
22.36	217	1,967	439	2,623	4,676	.N$$T$$S===D
22.42	217	2,097	439	2,753	4,833	.N$$T$$S===D
22.48	217	2,097	439	2,753	4,655	.N$$T$$S===D
22.54	109	2,097	312	2,518	4,293	.N$$T$S===D.
23.00	0	2,004	185	2,189	3,582	.$$$T$==D .
23.06	0	2,533	185	2,718	3,975	.$$$$T$=D .
23.12	0	3,155	93	3,248	4,624	.$$$$T$$S==D
23.18	0	3,243	0	3,243	4,619	.$$$$T$$S==D
23.24	0	3,331	0	3,331	4,708	.$$$$T$$S==D
23.30	0	2,705	0	2,705	3,795	.$$$$$S=D .
23.36	0	2,579	0	2,579	3,306	.$$$$S=D .
23.42	0	2,979	0	2,979	3,539	.$$$$$S=D
23.48	0	2,879	0	2,879	3,348	.$$$$$SD
23.54	0	2,976	0	2,976	3,330	.$$$$$SD
	29,497		19,972		224,149	TOTAL TRIPS (353 RECORDS)

A.M. & P.M. PEAK HOUR FACTORS FOR AUTO DRIVER HOME BASED WORK TRIPS AT AUTO OWNERSHIP LEVEL = 1 AND ALL INDUSTRY CATEGORIES

TABLE-3 FACTORS TO APPLY TO NON-DIRECTIONAL DEN SET TRIP TABLES TO PRODUCE DIRECTIONAL NUM SET PEAK PERIOD (7.12- 8.11) TRIPS

NUM SET	TOTAL DAILY TRIPS FROM HOME (1)	TO HOME (2)	TOTAL HOME (3)	NON-HOME (4)	SET TOTAL (5)	PEAK PERIOD TRIPS FROM HOME (6)	TO HOME (7)	TOTAL HOME (8)	NON-HOME (9)	SET TOTAL (10)	RATIO O/D (6+7)/8	DEN SET	(NUM SET PEAK)/(DEN SET DAILY) ORG FACT 6/3	DST FACT 7/3	NHB FACT 9/4	ORG FACT 6/5	DST FACT 7/5	NHB FACT 9/5
01	SET,IND=0-3																	
	29457	29931	59428	19972	79400	12214	955	13169	272	13441	93/07	*01	.206	.016	.014	.154	.012	.003
												02	.312	.024	.025	.245	.019	.005
												03	.214	.017	.014	.160	.013	.004
												04	.912	.071	.114	.774	.061	.017
02	SET,IND=4																	
	20330	18850	39180	10766	49946	7816	239	8055	319	8374	97/03	01	.132	.004	.016	.098	.003	.004
												*02	.199	.006	.030	.156	.005	.006
												03	.137	.004	.017	.103	.003	.004
												04	.584	.018	.134	.495	.015	.020
03	SET,IND=5-6																	
	30279	26754	57033	19130	76163	14896	462	15358	0	15358	97/03	01	.251	.008	--	.188	.006	--
												02	.380	.012	--	.298	.009	--
												*03	.261	.008	--	.196	.006	--
												04	.112	.034	--	.944	.029	--
04	SET,IND=7																	
	7148	6246	13394	2381	15775	3120	254	3374	199	3573	92/08	01	.053	.004	.010	.039	.003	.003
												02	.080	.006	.018	.062	.005	.004
												03	.055	.004	.010	.041	.003	.003
												*04	.233	.019	.084	.198	.016	.013

TABLE-3 FACTORS TO APPLY TO NON-DIRECTIONAL DEN SET TRIP TABLES TO PRODUCE DIRECTIONAL NUM SET PEAK PERIOD (16.24-17.23) TRIPS

NUM SET	TOTAL DAILY TRIPS FROM HOME (1)	TO HOME (2)	TOTAL HOME (3)	NON-HOME (4)	SET TOTAL (5)	PEAK PERIOD TRIPS FROM HOME (6)	TO HOME (7)	TOTAL HOME (8)	NON-HOME (9)	SET TOTAL (10)	RATIO O/D (6+7)/8	DEN SET	(NUM SET PEAK)/(DEN SET DAILY) ORG FACT 6/3	DST FACT 7/3	NHB FACT 9/4	ORG FACT 6/5	DST FACT 7/5	NHB FACT 9/5
01	SET,INC=0-3																	
	29497	29931	59428	19972	79400	534	12266	12800	2956	15756	4/96	*01	.009	.206	.148	.007	.154	.037
												02	.014	.313	.275	.011	.246	.059
												03	.009	.215	.155	.007	.161	.039
												04	.040	.916	.241	.034	.778	.187
02	SET,IND=4																	
	20330	18850	39180	10766	49946	519	5132	5651	1590	7241	9/91	01	.009	.086	.080	.007	.065	.020
												*02	.013	.131	.148	.010	.103	.032
												03	.009	.090	.083	.007	.067	.021
												04	.039	.383	.668	.033	.325	.101
03	SET,IND=5-6																	
	30279	26754	57033	19130	76163	457	9642	10099	2402	12501	5/95	01	.009	.162	.120	.006	.121	.030
												02	.012	.246	.223	.009	.193	.048
												*03	.008	.169	.126	.006	.127	.032
												04	.034	.720	.009	.029	.611	.152

2. NUMBER 2 CARD ANALYSIS WITH TRIP MAKER'S INCOME APPENDED

The Fortran program to merge income data to the Number 2 cards and a PRKTAB computer program to stratify the data are presented below. On the next page the auto driver home based work trip stratification by income and industry type is given.

```
//ROYDPK JOB (30320604018,XXXXXX,XXXX),JPB,TIME=10
//JOBLIB DD DSN=HP.APLANPAC,UNIT=3330,VOL=SER=CENG11,DISP=SHR
//MERGE EXEC FORTGCG,REGION=400K
XXDEFAULT  PROC  PAPER=A,OBJBLK=38,DSET='SYS1.DUMMY'
XXFORT     EXEC  PGM=IEYFORT,REGION=104K
XXSYSLIN   DD DSN=&&LOADSET,DISP=(MOD,PASS),UNIT=VSYSDA,
XX            SPACE=(400,(&OBJBLK,20),,,ROUND),DCB=BLKSIZE=400
XXSYSPRINT DD SYSOUT=&PAPER,DCB=BLKSIZE=1920
//FORT.SYSIN DD *,DCB=BLKSIZE=80
      DIMENSION NC1(525,100),NCRD(30)
      DO 8 I=1,525
      DO 8 J=1,100
8     NC1(I,J)=0
      DO 10 I=1,28501
      READ(1,100) NCT,NSAM,INCOM,NZON
      IF(NCT.EQ.9) GOTO 12
      NC1(NZON,NSAM) =INCOM
10    CONTINUE
12    DO 11 I=1,18527
      READ (2,101) (NCRD(M),M=1,23)
      J=NCRD(20)
      K=NCRD(4)
      NCRD(17)=NC1(J,K)
      WRITE(10,102) (NCRD(MM),MM=1,23)
11    CONTINUE
100   FORMAT(I1,9X,I3,39X,I2,20X,I3,3X)
101   FORMAT(2A4,A2,I3,12A4,I2,A4,A1,I3,3A3)
102   FORMAT(2A4,A2,I3,12A4,I2,A4,A1,I3,3A3)
      END
XXGO       EXEC  PGM=LOADER,COND=(4,LT,FORT)
*** TO RECEIVE LOADER OUTPUT ADD "//SYSLOUT DD SYSOUT=A" TO STEP
XXSYSLIB   DD DSN=SYS1.FORTLIB,DISP=SHR
XX         DD DSN=SYS1.UGALIB,DISP=SHR
XX         DD DSN=&DSET,DISP=SHR
XXSYSLIN   DD DSN=&&LOADSET,DISP=(OLD,DELETE)
XX         DD DDNAME=LOADLKIN
XXFT05F001 DD DDNAME=SYSIN
XXFT06F001 DD SYSOUT=&PAPER,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=1922)
//GO.SYSLOUT DD SYSOUT=A
//GO.FT01F001 DD UNIT=2400,DISP=(OLD,PASS),VOL=SER=GT1000,
//    LABEL=(1,SL,,IN),DSN=HP.A1CROS.EFC.CTSN
//GO.FT02F001 DD DISP=(OLD,KEEP),VOL=SER=CENG11,
//    UNIT=3330,DSN=HP.A2CROS.EFCL.CTSNPNTN.INTINT
//GO.FT10F001 DD DSN=HP.A2CROS.INCOME,UNIT=3330,DISP=(NEW,KEEP),
//   VOL=SER=CENG11,SPACE=(TRK,(150,10),RLSE),
//    DCB=(RECFM=FB,BLKSIZE=3200,LRECL=80)
//GO.SYSIN DD *,DCB=BLKSIZE=80
//XCL EXEC PGM=PRKTAB,REGION=112K
//DPRTAPE DD SYSOUT=A
//PRKRECI DD DISP=(OLD,KEEP),UNIT=3330,VOL=SER=CENG11,
//    DSN=HP.A2CROS.INCOME
//SYSIN DD *,DCB=BLKSIZE=80
ID,   INCOME & INDUSTRY DISTRIBUTION

PAR,COLUMNS=80,NONSTD

DEFINE,IND=27,MODE=41,PURP=48-49,INC=62-63

SELECT,MODE=1,2,PURP=01,10          HBWORK AUTO DRIVER

HEAD-TABLE1,NO. 2 CARDS BY INCOME & INDUSTRY

TABLE-TABLE1,PARAM=COUNT
                ROW=IND,0-3,4,5-6,7,8,9
                COL=INC,00-04,05-09,10,11,12,13
                ROWPCT,COLPCT,TOTPCT

GO
```

TABLE- TABLE1 2 CARDS BY INCOME & INDUSTRY -HBWORK AUTO DRIVER 3/28/78 PAGE 1
SCALE FACTOR = 1.000

IND	INC 0-4	INC 5-9	INC 10-10	INC 11-11	INC 12-12	INC 13-13	TOTAL
0- 3	105	602	75	63	486	0	1331
4- 4	36	476	53	50	354	0	869
5- 6	50	518	98	85	437	0	1188
7- 7	22	143	23	16	104	0	308
8- 8	4	0	0	0	0	0	4
9- 9	11	37	10	11	27	0	96
TOTAL	228	1676	259	225	1408	0	3796

TABLE- TABLE1 PCWFCT 2 CARDS BY INCOME & INDUSTRY-HBWORK AUTO DRIVER 3/28/78 PAGE 2
SCALE FACTOR = 1.000

IND	INC 0-4	INC 5-9	INC 10-10	INC 11-11	INC 12-12	INC 13-13	TOTAL
0- 3	7.9	45.2	5.6	4.7	36.5	0.0	100.0
4- 4	4.1	43.3	6.1	5.8	40.7	0.0	100.0
5- 6	4.2	43.6	8.2	7.2	36.8	0.0	100.0
7- 7	7.1	46.4	7.5	5.2	33.8	0.0	100.0
8- 8	100.0	0.0	0.0	0.0	0.0	0.0	100.0
9- 9	11.5	38.5	10.4	11.5	28.1	0.0	100.0
TOTAL	6.0	44.2	6.8	5.9	37.1	0.0	100.0

TABLE- TABLE1 COLPCT 2 CARDS BY INCOME & INDUSTRY- HBWORK AUTO DRIVER 3/28/78 PAGE 3
SCALE FACTOR = 1.000

IND	INC 0-4	INC 5-9	INC 10-10	INC 11-11	INC 12-12	INC 13-13	TOTAL
0- 3	46.1	35.9	29.0	28.0	34.5	0.0	35.1
4- 4	15.8	22.4	20.5	22.2	25.1	0.0	22.9
5- 6	21.9	30.9	37.8	37.8	31.0	0.0	31.3
7- 7	9.6	8.5	8.9	7.1	7.4	0.0	8.1
8- 8	1.8	0.0	0.0	0.0	0.0	0.0	0.1
9- 9	4.8	2.2	3.9	4.9	1.9	0.0	2.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE- TABLE1 TOTPCT 2 CARDS BY INCOME & INDUSTRY -HBWORK AUTO DRIVER 3/28/78 PAGE 4
SCALE FACTOR = 1.000

IND	INC 0-4	INC 5-9	INC 10-10	INC 11-11	INC 12-12	INC 13-13	TOTAL
0- 3	2.8	15.9	2.0	1.7	12.8	0.0	35.1
4- 4	0.9	12.5	1.4	1.3	9.3	0.0	22.8

3. NUMBER 2 CARD ANALYSIS WITH TRIP MAKER'S AUTO OWNERSHIP APPENDED

The Fortran program to merge auto ownership data to the Number 2 cards and a PRKTAB computer program to stratify the data are presented below. On the next page the total trip file stratification by auto ownership and industry type is given.

```
//BOYDPK JOB (3032060401,XXXXXX,XXXX),JPB,TIME=10
//*BOYDPK  ********************************************
//*BOYDPK                  REPLY U TO CENG11
//*BOYDPK                  ****TAPE****
//*BOYDPK        VRN=U2856 VOL=SER=GT1000  NO RING
//*BOYDPK  ********************************************
//JOBLIB DD DSN=HP.APLAMLAC,UNIT=3330,VOL=SER=CENG11,DISP=SHR
//MERGE EXEC FORTCG,REGION=400K
//FORT.SYSIN DD *
      DIMENSION NC1(525,100),NCRD(30)
      DO 8 I=1,525
      DO 8 J=1,100
8     NC1(I,J)=0
      DO 10 I=1,2850
      READ(1,100)NCT,NSAM,NAUT,NOTH,NZON
      IF(NCT.LG.9) GOTO 12
      NUM=NAUT+NOTH
      IF(NUM.GE.3)NUM=3
      NC1(NZON,NSAM)=NUM
10    CONTINUE
12    DO 11 I=1,18627
      READ (2,101) (NCRD(M),M=1,23)
      J=NCRD(20)
      K=NCRD(4)
      NCRD(18)=NC1(J,K)
      WRITE(10,102) (NCRD(MM),MM=1,23)
11    CONTINUE
  100 FORMAT(I1,9X,I3,10X,2I1,49X,I3,3X)
  101 FORMAT(2A4,A2,I3,12A4,A2,I1,A4,I3,3A3)
  102 FORMAT(2A4,A2,I3,12A4,A2,I1,A4,I3,3A3)
      END
//GO.SYSLOUT DD SYSOUT=A
//GO.FT01F001 DD UNIT=2400,DISP=(OLD,PASS),VOL=SER=GT1000,
//    LABEL=(1,SL,,IN),DSN=HP.A1CRDS.LFC.CTSN
//GO.FT02F001 DD DISP=(OLD,KEEP),VOL=SER=CENG11,
//    UNIT=3330,DSN=HP.A2CRDS.INCOME
//GO.FT10F001 DD DSN=HP.A2CRDS.AUTOWN,UNIT=3330,DISP=(NEW,KEEP),
//  VOL=SER=CENG11,SPACE=(TRK,(150,10),RLSE),
//    DCB=(RECFM=FB,BLKSIZE=3200,LRECL=80)
//GO.SYSIN DD *
/*
//XCL EXEC PGM=PRKTAB,REGION=112K
//DPUTAPE DD SYSOUT=A
//PRKRECI DD DISP=(OLD,KEEP),UNIT=3330,VOL=SER=CENG11,
//    DSN=HP.A2CRDS.AUTOWN
//SYSIN DD *
/*
ID,   AUTO OWNERSHIP & INDUSTRY DISTRIBUTION

PAR,COLUMNS=80,NONSTD

DEFINE,IND=27,MODE=41,PURP=48-49,INC=62-63,AUTO=64

HEAD=TABLE1,NO. 2 CARDS BY AUTO OWNERSHIP & INDUSTRY

TABLE=TABLE1,PARAM=COUNT
                ROW=IND,0-3,4,5-6,7,8,9
                COL=AUTO,0,1,2,3
                ROWPCT,COLPCT,TOTPCT

GO
```

TABLE- TABLE1 2 CARDS BY AUTO OWNERSHIP & INDUSTRY 4/04/78 PAGE 1
SCALE FACTOR = 1.000

IND	AUTO 0- 0	AUTO 1- 1	AUTO 2- 2	AUTO 3- 3	TOTAL
0- 3	5	816	1812	639	3323
4- 4	7	552	1113	461	2202
5- 6	16	685	1843	740	3580
7- 7	4	185	465	148	822
8- 8	12	291	217	65	701
9- 9	34	1434	4311	1754	7699
TOTAL	736	4223	9761	3807	18527

TABLE- TABLE1 ROWPCT 2 CARDS BY AUTO OWNERSHIP & INDUSTRY 4/04/78 PAGE 2
SCALE FACTOR = 1.000

IND	AUTO 0- 0	AUTO 1- 1	AUTO 2- 2	AUTO 3- 3	TOTAL
0- 3	1.5	24.6	54.5	19.2	100.0
4- 4	3.5	25.1	50.5	20.9	100.0
5- 6	4.6	19.1	51.5	20.7	100.0
7- 7	2.4	22.5	56.6	18.0	100.0
8- 8	10.3	41.5	31.0	9.3	100.0
9- 9	4.4	18.6	56.6	22.2	100.0
TOTAL	4.0	22.8	52.7	20.5	100.0

TABLE- TABLE1 COLPCT 2 CARDS BY AUTO OWNERSHIP & INDUSTRY 4/04/78 PAGE 3
SCALE FACTOR = 1.000

IND	AUTO 0- 0	AUTO 1- 1	AUTO 2- 2	AUTO 3- 3	TOTAL
0- 3	7.4	19.4	18.6	16.8	17.9
4- 4	10.3	13.1	11.4	12.1	11.9
5- 6	14.7	21.1	18.5	19.4	19.3
7- 7	2.5	4.4	4.8	3.5	4.4
8- 8	16.4	6.9	2.2	1.7	3.8
9- 9	47.0	34.2	44.2	46.1	42.6
TOTAL	100.0	100.0	100.0	100.0	100.0

TABLE- TABLE1 TOTPCT 2 CARDS BY AUTO OWNERSHIP & INDUSTRY 4/04/78 PAGE 4
SCALE FACTOR = 1.000

IND	AUTO 0- 0	AUTO 1- 1	AUTO 2- 2	AUTO 3- 3	TOTAL
0- 3	0.3	4.4	9.6	3.4	17.9

CONTRACT RESEARCH
GDOT RESEARCH PROJECT NO. 7005
FINAL REPORT

DEVELOPMENT OF AN URBAN PEAK-HOUR TRAFFIC MODEL BASED ON THE 1970 CENSUS AND CONCURRENT GROUND COUNTS PHASE II

by
Donald O. Covault
Professor of Civil Engineering
and
M. John Moskaluk
Graduate Research Engineer

School of Civil Engineering
Georgia Institute of Technology
Atlanta, Georgia 30332

Prepared for

Department of Transportation
State of Georgia

In Cooperation With

U. S. Department of Transportation
Federal Highway Administration

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ACKNOWLEGEMENTS

The authors would like to acknowledge the technical assistance received from the Georgia Department of Transportation, the Atlanta Regional Commission and the U. S. Bureau of Census. We especially thank Mr. Herman Griffin of the Georgia Department of Transportation, Mr. John Wilson of the Atlanta Regional Commission, and Mr. Marshall Turner of the U. S. Bureau of Census. These individuals greatly assisted the Research Team through their continued willingness to answer questions and furnish data.

This research project has been conducted by the Georgia Institute of Technology, School of Civil Engineering. Dr. Donald Covault, Professor, is the Principal Investigator. He and his two assistants, for purposes of this report are considered the Research Team. Likewise, the opinions and conclusions expressed or implied in this document are those of the Research Team. They are not necessarily shared by the sponsors of this project.

I. INTRODUCTION

This research project, "Development of an Urban Peak-Hour Traffic Model Based on the 1970 Census and Concurrent Ground Counts - Phase II", is the second phase of the project started in 1970. The first phase gathered 24-hour volume data at 140 roadway locations. Available volume data were also gathered for 123 locations from State files. In total, the Phase I tabulated 263 volume counts which are used as the concurrent ground counts for the Phase II research effort.

The Phase I project also investigated the 1970 Census Urban Transportation Planning Package (UTPP). In the form that the UTPP file was received, it was concluded taht it was unsatisfactory to use for trip assignment. The Phase I report described alternative approaches to use the UTPP file for traffic assignment.

The primary objective of the Phase II research is the development of a peak-hour model for the Atlanta SMSA using the 1970 Census UTPP file that is applicable to long-range planning and to Transportation System Management (TSM) requirements. In conjunction with this objective, a special research project for a Master Degree in CE at Georgia Tech has been undertaken to develop a methodology to estimate peak-hour factors. A secondary objective is an evaluation of the transportation related questions contained in the 1980 Census Instrument.

The purpose of this report is to describe in sufficient detail the research procedures used and the conclusions derived. Each of the research objectives are considered separately in the report. In addition, a number of technical memorandum have been prepared during the project.

A summary description of these memorandum are included in the report and where applicable the reader is referred to the particular document for further information.

BACKGROUND

Great efforts have been expended in the Atlanta Region on the development of a rational and balanced transportation program. Past studies have concentrated on comprehensive, cooperative, and continuing plan development. On a continuing basis, the transportation plan must be monitored and updated to account for urban growth and change. Plan revisions are especially important in the short range to achieve the optimum utilization of existing facilities. Consistent with this attitude and in an attempt to replace the need for origin-destination studies, the U. S. Department of Transportation in cooperation with the U. S. Bureau of Census collected work trip information in the 1970 Census Instrument. Sample size for these data is approximately 15 percent.

Of particular concern and interest is the tabulation of work trips be made between the zone of residence and the zone of employment (the destination). The Bureau of Census has coded these trips by traffic analysis zone and furnished this information to the Georgia Department of Transportation as the 1970 Census Urban Transportation Planning Package (UTPP).

In 1970, the Georgia Department of Transportation (GDOT) in cooperation with the Federal Highway Administration engaged the Georgia Institute of Technology to conduct research using the UTPP file. The objective of the research (Project Number 7005-Phase I) was the development of a peak-hour, work-trip oriented forecasting model for the Atlanta SMSA area. The model was intended to give the planner an analysis tool to assess the transportation conditions of an urban area.

The UTPP file was received by GDOT in May, 1974. After a detailed review, it was concluded by GDOT that the work trip table developed by the census was unacceptable for traffic assignment. The primary reason was the manner in which the Bureau of Census geocoded the work trip destinations. Specifically, respondents were asked to provide an explicit street address for their place of work. An address coding guide (ACG) was then used to code that trip. Unfortunately, the ACG did not cover the entire Atlanta SMSA; it was limited to the area contained inside the perimeter. Hence SMSA residents whose place of work was not within the ACG description had their work trip destination coded to a zip code number (ZC), an enumeration district (ED), or a universal area code (UAC). Respondents who did not provide an adequate or complete work address were coded with undesignated destinations using a dummy number equal to 99998. Thus, the primary deficiency of the Atlanta UTPP file is that only 56 percent of the work trip destinations are coded to traffic analysis zones. The remainder are coded to either ZC, ED, UAC or to 99998.

Similar difficulties were encountered in other urban areas. In the Delaware Valley Planning Region only 35 percent of the region's nearly 2 million work trips were coded to traffic zones. Albuquerque, New Mexico reported 64 percent, Wilmington, Delaware reported 55 percent, and California averaged 57 percent for 14 SMSA's. Because of the inadequate coding, the Tri-State Regional Planning Commission abandoned their attempt to use the UTPP data and requested the Bureau to generate a worker file.

At that time Project Number 7005-Phase I was terminated because of the poor geocoding of the work trip data. It was concluded that the UTPP file did not provide the desired level of data.

Between 1974 and the early part of 1976 no work was accomplished on the UTPP file. Then in 1976, GDOT requested Georgia Tech's Dr. Covault to take another look at developing a peak-hour model using the UTPP file. The present contract (7005-Phase II) was consumated from these renewed interests.

REPORTS

A number of technical memoranda have been prepared by the Research Team during the project. These memoranda have a specific topic and have been used to inform the Georgia Department of Transportation of project progress and findings. The following is a brief description of the various memoranda.

WORK PLAN: Development of an Urban Peak-Hour Model Based on the 1970 Census and Concurrent Ground Counts, Phase II; February 22, 1977 (1)

This memorandum describes in detail the proposed research. It delineates the project stages and the tasks associated with each stage. The detailed work plan has been accepted by the Georgia Department of Transportation and the Federal Highway Administration.

EXECUTIVE SUMMARY: April 7, 1977 (2)

The summary deals with the conclusions and findings of the Phase I portion of the project. Additionally, the memorandum describes the findings from the comprehensive literature search.

Interim Report: Status of the 1980 Census Instrument, May, 1977. (3)

The report addresses two topic areas:

1. The Research Team's preliminary findings and status of the 1980 Census Instrument. It recommends that if the State of Georgia desires to suggest changes to the Instrument questions, the State should move quickly because the Instrument will probably be finalized by the summer of 1977.
2. The Research Team has developed a questionnaire to determine the interest in tranportation information being collected through the Census. The findings and conclusions of the questionnaire are summarized in the report.

Technical Report for Stage C: Status of Transportation Questions on the 1980 U. S. Census, March 20, 1978 (4)

This report presents a summary of the status of the 1980 Census Instrument. It discusses the pretests that have been held in 1977 and the proposed pretests scheduled for 1978. The report also states that the 1980 Instrument is in final form and will be presented to Congress for approval which normally is a formality.

Report to the Project Advisory Committee, March 22, 1978 (5)

The report presents the minutes of the meeting held on February 21, 1978 between the Project Advisory Committee and the Research Team. The significant conclusion of the meeting is that the research project should be terminated. The justification and rationale for this termination is discussed in Chapter 2 of this report.

Technical Report for Stage B: Research Methodology, May, 1978 (6)

The report presents a summary of the methodology utilized in the project. It is in sufficient detail so that the reader can achieve an understanding of the procedure. Weaknesses of the procedure are pointed out to alert other researchers of potential problem areas.

II. METHODOLOGY

The Phase II research project has two distinct components. The first was the development of a peak-hour methodology for the Atlanta SMSA based on the 1970 Census journey to work trip information. The second component was a review with recommendations of the transportation related questions to be included in the 1980 Census Instrument. This chapter is divided into two sections with the first addressing the peak-hour methodology and the second discussing the 1980 Census questions.

PEAK-HOUR METHODOLOGY

A library search has been conducted early in the project. Numerous techniques employed by other researchers have been reviewed. Two research efforts are reported in sufficient detail to explain the technique employed and the conclusions derived. The first report is Travel Demand Forecast Models, Phase 2 [7], and the second one is The Use of Census Data for Updating Urban Transportation Studies [8].

The Travel Demand Forecast Models, Phase 2 report describes the results of calibrating a peak-hour model for the St. Louis, Missouri area. The model that has been developed in St. Louis is based on the postulation that a relationship exists between 24-hour, home-to-work travel and total peak-hour travel. The model also postulates that travel varies as a function of zone-to-zone travel time and the employment density at the attraction zone. Based on the number of attributes, i.e., high percentage of work trips during the peak-hour and the stability of the home-to-work trip, the report concludes that the home-to-work travel is a good determinant of peak travel.

Two models, one for auto drivers and one for transit, are considered. The general conclusion is that the models over-estimate actual trips by 17.8 percent. This slight over-estimate is concluded to be reasonable. Further the report concludes that good correlation exists between the 1965-66 Origin and Destination Study and the Census work trip frequency distribution.

The methodology that has been developed in St. Louis is not used directly in this research approach. However, the report has been used as a continual reference because of its excellent summary of model methodology and the adjustments required to the Census data. The reader is directed to the Executive Summary prepared by Georgia Tech in April, 1977 for further details.

The second report which is directly applicable to this research is the Use of Census Data for Updating Transportation Studies. For purposes of this report, this study will be considered the Comsis Report. The Comsis Report describes the adequacy testing of three methods of forecasting average daily traffic volumes in the State of Rhode Island. Comsis Report Method 3 is considered most applicable to the present research. Briefly stated, this method is:

> "Determine the accuracy of average daily auto driver link volumes developed by estimating average daily trip productions and attractions as a function of the primary work trip productions and attractions and other socio-economic variables that are reported in the Census documents" [8]

Method three is based on the assumptions that a relationship exists between average-daily and primary work trip productions and attractions. Given this relationship, i.e, primary work productions and

attractions from the Census journey-to-work trip information and a calibrated distribution and assignment model, it follows that ADT link volume estimates can be developed. This technique has been used by Comsis and they have reported approximately a 3 percent under-estimate when compared to ground count information. Again the reader is directed to the April, 1977 Georgia Tech Executive Summary.

Based on the Library Search and discussions with the sponsoring agencies, the Research Team has developed a set of hypotheses to research the possible development of a peak-hour model for the Atlanta SMSA. These hypotheses include:

- A relationship exists between 24-hour journey-to-work trips and all-purpose peak-hour trips. (All purpose is defined to include home based work, shop, social, recreation, school, and other as well as non-home based travel.)

- A mathematical proportioning technique founded on employment distribution can be developed and used to allocate undersignated work trips in the Census journey-to-work file.

- The traditional planning techniques using calibrated models, i.e., gravity, logit modal split and assignment, which have been developed by others can be used to generate an all-purpose link volume.

- The 1970 historical record (HR) network can be used to assign the all-purpose trip table.

- A peak-hour factoring methodology stratified by socio-economic parameters can be developed so that the by-purpose trip tables can be converted from 24-hour to peak-hour and then merged.

- Generalized peak-hour factors can be developed and applied to 24-hour assigned link volumes.

- An evaluation analysis can be developed that uses the 265-ground count data collected in Phase I of this project.

It should be noted that there are two distinct methodologies suggested in the hypothesis statement. The first method factors the by-purpose trip tables and then merges these factored tables into an all-purpose peak-hour trip table. This all-purpose trip table is then assigned to the HR with the end results being synthesized peak-hour link volumes. These volumes can then be compared with the 265-ground count locations and accuracy of the methodology can be ascertained. The second procedure uses an all-purpose 24-hour trip table for the assignment. The 24-hour link volumes are factored to represent peak-hour flow for evaluation with the 265-ground count locations. This second procedure is the traditional approach that is often used in the 3-C transportation planning process. In Atlanta, the standard FHWA peak-hour factors have been augmented where possible with data collected in 1972.

At the beginning of this research project, the Research Team was prepared to develop the necessary analytical techniques to test and evaluate both of the procedures. It was anticipated that one of these techniques would yield a useful product for the Atlanta SMSA. It was further anticipated that the selected methodology would be directly transferable to other SMSA's in Georgia.

In 1972, Georgia Department of Transportation/Atlanta Regional Commission (GDOT/ARC) conducted a half of one percent origin-destination survey in the Atlanta SMSA seven county area. The sample consisted of 2851 dwelling units which represent 18,527 all-purpose trips. Additionally, studies were made to estimate special generator trips, truck travel and external trips. The traditional transportation planning process followed this work.

Of particular importance to this research project is the calibrated models and the trip tables for truck and external travel. These data are used as the foundation for the Census file analysis and the development of a peak-hour model. From the time that this project was formulated, the Research Team has presumed that the use of these data provided the most expeditious utilization of previous projects. This assumption has proven to be a major weakness in the research methodology. For a detailed explanation and analysis of the GDOT/ARC transportation planning process methodology the reader is directed to the document Atlanta Region Transportation Planning Models[9]

The following portion of this section is devoted to a detailed description of the steps undertaken during the research project. Each step is written as a separate entity; however, there are many avenues of feedback that have been dropped for clarity. The University of Georgia at Athens IBM 370/158 MVS computer facility has been used for processing the FHWA Transportation Planning Battery of programs and the numerous Research Team developed programs. All of the programs developed by the Research Team are written in Fortran IV and are available to the sponsoring agencies.

Step One - Development of an Equivalence File

In recording the journey-to-work trip data, the Bureau of Census has used traffic analysis zone information furnished by the Georgia Department of Transportation. Where it was impossible for a variety of reasons to code the work attraction end of the trip, the Bureau has used dummy codes supplied by GDOT that represent zip codes, enumeration

districts, universal codes and undesignated destinations.

The traffic analysis zones given to the Bureau of Census are made up of 1548 zones that correspond to the zoning system used prior to 1970. These zones are nonsequentially numbered Ø to 8994. Based on the Research Team's investigation, this numbering system does not violate Census Tract boundaries and corresponds directly to the 525 zone system that has been developed since 1970.

It should be recognized that the two traffic analysis zone systems (1548 zones and 525 zones) represent the same study area. Thus on numerous occasions, the 525 zone system is composed of more than one zone from the 1548 system. In essence, the 525 zone system is a aggregation of zones into more homogeneous units at a higher degree of manageability.

To code work trip destinations to zip codes, universal area codes and enumeration districts, the Bureau of Census has used the GDOT furnished dummy numbers. The dummy number equivalence for each of these designations is:

Designation	Dummy Number Range
Zip Codes	9001-9451
Universal Area Codes	9452-9480
Enumeration District	9481-9621

By subtraction, it is obvious that there are 620 additional designations that must be converted to traffic analysis zones.

It is cautioned that this conversion is not a straightforward matter. The Georgia Department of Transportation does not have complete files as to what particular areas within the study area are represented by the dummy codes. Further, much of the data concerning the dummy

numbers is conflicting. The dummy numbers have presented an enigma which in many cases has been solved by engineering judgement.

Some of the problems associated with using the dummy numbers are:

- Zip codes and universal area codes violate census tract boundary; they do not conform uniformally to traffic analysis zones.
- Enumeration districts are numbered to correspond to the County in which they are located. For example, the same enumeration district number can appear in more than one county.
- Dummy numbers do not conform to a rational geographic representation of the area. For example, it is common to have dummy numbers represent a particular area which is geographically impossible.
- The postal service does not have a comprehensive zip code map so that a rational geographic boundary can be associated with a zip code.
- A zip code is not an appropriate surrogate descriptor because the place of work is not indicated by the zip code. Employees of the Gulf Oil, for example, work south of the CBD but the zip codes associated with Gulf Oil in the main Post Office is in the heart of the CBD. This is not a unique occurrence but instead it is a typical situation for the large corporation located in the Altanta SMSA.

Because of these associated problems with zip codes, universal area codes and enumerations districts and their related dummy numbers, the Research Team urges the Bureau of Census not to use these surrogate descriptors.

Recognizing the above problem, the Research Team has proceeded in the development of the equivalence file. A member of the Research Team has interviewed the Public Relations Director at Atlanta's Main Post Office to resolve zip code conflicts. The Director, in turn,

has discussed the boundaries with many of the postal staff, especially the mail carriers. At the beginning of this conversion effort, the Research Team used a zip code map prepared by ARC. However, this map has been found in error. Thus, the Research Team has concluded that the discussions with the postal staff are the highest level of reliability possible, to determine zip code boundaries

In a similar manner, a member of the Research Team has interviewed the local Bureau of Census in defining the boundaries of enumeration districts. Again, this process has proved to be tremendously subjective and relied heavily on the local knowledge of the Bureau of Census staff.

For both zip codes and enumeration districts, the Research Team has equated the appropriate zones from the 525 zone system. The Universal Area Code work trips have been distributed using a calibrated gravity model. This process is discussed later in this report.

In summary, a subjective analysis has been devised to equate dummy descriptions used in UTPP file to the 525 zone system. In a non-statistical subjective manner, the Research Team estimates that the use of this type of engineering judgement has caused approximately a plus or minus 30 percent error in the completed equivalence table. However, it has been further concluded that this approach is the best possible without attempting to re-do the work previously undertaken by the Georgia Department of Transportation and the Bureau of Census. It is also suggested that a complete revision of the UTPP file by the Research Team is not possible because of anonymity problem and the associated cost.

Step Two - Development of Equivalence Computer Program

Once the equivalence table was complete, a computer program has been developed to convert the UTPP file into the 525 zone system. In its original form, the UTPP file contains 51,751 records. A record in this context represents a zonal "i-j" pair with "x" journey-to-work trips associated with that pair. It should be recognized that the UTPP file represents the 24-hour home-to-work trip pattern. The UTPP file does not contain any data concerning the work-to-home trip. This is an important consideration because in Atlanta the highest peak hour occurs in the PM when the work trip is predominantly work-to-home.

When the UTPP file is investigated in detail, the following statistics are readily apparent:

Work Trip Destinations Allocated to	Number of Trips	Percent of Total
1548 Nonsequential Zones	328,168	56.5%
Zip Code Designations	161,958	27.8%
Enumerations Designations	216	0.1%
Universal Area Code Designations	38,003	6.5%
Not Allocated	53,148	9.1%
Total Trips	581,943	100.0%

It is interesting to compare the work total trips (expanded) from the UTPP file and the work total trips estimated by GDOT/ARC. In comparison,

UTPP Work Trips = 581,943
GDOT/ARC Work Trips = 1,045,422
Difference 463,479 or (-44.3%)

The UTPP expanded files underestimates the GDOT/ARC estimate by 44.3 percent. The logical question to ask is which estimate is correct. UTPP estimate has a high degree of intuitive appeal because it is derived from approximately a 15 percent sample. However, the GDOT/ARC estimate has undergone an accuracy check and their estimate satisfies the limits of tolerance. The question remains unanswered as to which estimate is correct. Perhaps when the U. S. Bureau of Census Housing Survey becomes available, the work related questions in that survey will shed some information concerning the order of magnitude of the number of work trips.

Considering the summary table above, the computer must convert the unallocated trips (approximately 44 percent) to the 525 zone system. In addition, the 1548 nonsequential zones must be converted to the 525 zone system. Finally, the program must merge all of these trips together into a Census journey to work trip table in terms of the 525 zone system. Theoretically, this trip table is a 525 x 525 matrix.

Specifically, the program accomplishes the following tasks:

- Assign the residential zone (1548 nonsequential) on a zone by zone basis to the 525 zone ststem.
- Check the destination end of the "i-j" pair to determine if it is a nonsequential zone, a zip code, a universal area code, an enumeration district or an unallocated destination.
- If it is a nonsequential zone, assign it directly to the appropriate zone in the 525 zone system.
- If it is a zip code or enumeration district, distribute the trip to the dummy destinations using the formula

$$t_j = T_j \frac{e_j}{E_j}$$

where:

T_j = number of trips calculated for the individual dummy zone

e_j = the number of employees in that dummy zone

t_j = the total work trips associated with the dummy description

E_j = the total number of employees in the dummy description

(Note: The above formula was derived by the Comsis Corporation and reported in their study The Use of Census Data for Updating Urban Transportation Studies.[8] A detailed explanation of the rationale of the formula is contained in the Georgia Tech Executive Summary).

- After the journey-to-work trips are proportioned among the zones in the dummy descriptions, the dummy zones are assigned directly to the appropriate zone in the 525 zone system.
- If it is a universal area code or an unallocated dummy description, the program generates a separate file and assigns and totals the number of trips to the appropriate origin zone.
- After considering all 51,751 records, the program stores two files, i.e.,
  1. allocated UTPP trips in terms of the 525 zone system.
  2. unallocated UTPP trips by zone of origin.

From the GDOT/ARC data, the Research Team has obtained the work related friction factor (F_{ij}'s) file. This file in conjunction with the FHWA Battery program "GM" and the unallocated UTPP trips are processed to generate a trip table that distributes the UTPP trips and the trip interchanges from the GM procedure to yield a composite trip table. In summary this trip table represents the trip interchanges as

reported in the 1970 Census Instrument modified to account for the various aberrations described above. The remainder of this report will refer to this product as the UTPP trip table. The reader is reminded that it is modified and subject to all errors associated with engineering judgement, dummy descriptors and the proportioning technique to allocate trips.

Step 3 - Development of All-Purpose Trip Generation Models

An agreement of the research contract is that the Research Team will make maximum utilization of existing GDOT/ARC data base. Included in this agreement is all of the previous transportation planning effort accomplished by the participating agencies. In particular, the Research Team agreed to utilize the existing data base and the available models where appropriate in the research application.

Two models that are not available are the trip generation models for all-purpose productions and attractions. To build these models, the Research Team has used the GDOT/ARC data base. Thus, the models derived reflect the same level of data accuracies as the GDOT/ARC models.

To derive an all-purpose home-based trip productions model, the Research Team has used the GDOT/ARC cross-classification matrices. For each stratification, the by-purpose trip production rates are cummulated to give an all-purpose home-based trip production matrix.

For further clarification the reader is directed to Exhibit 1. This Exhibit, Home Based Work Trip Productions is reproduced from the ARC publication Atlanta Region Transportation Planning Models;[9]

EXHIBIT 1

HOME BASED WORK TRIP PRODUCTIONS

Persons Per Household	Automobiles Per Household		
	0	1	2^+
1	0.600	0.896	1.714
2	1.000	1.600	2.300
3	1.417	2.250	2.750
4^+	1.850	2.000	2.900

SOURCE: Atlanta Region Transportation Planning Models Technical Documentation, Atlanta Regional Commission, December, 1976.

also, the document that provides a detailed explanation of the by-purpose cross-classification matrices. The stratifications of the matrix are persons per household vs. autos per household. To find a particular rate, all one needs to do is to select the correct row and column and read the trip rate at the intersection of the row and column. For example, with 2 persons per household and 1 auto per household, the home-based work production rate is 1.600.

The next table , Exhibit 2, is the all-purpose home-based trip production matrix. In a similar manner, to select a particular rate, determine the appropriate row and column and read the rate at the intersection. In this case, 2 persons per household with 1 auto per household has an all-purpose home-based trip production rate of 4.672. With this stratification, the average household on the average makes approximately one out of three trips to or from work.

To relate this all-purpose matrix to the UTPP file, the all-purpose matrix has been made a function of the work trip production and is illustrated in Exhibit 3. This is accomplished by dividing each cell of the matrix by the corresponding work trip rate. Using the same example, the all-purpose productions (4.672) divided by the work productions (1.600) yield a value of 2.920. This value is interpreted as the all-purpose productions divided by the work purpose productions. Literally, it has the same definition as above, the average two member household makes approximately one out of three trips to or from work.

The second model that has been derived is the trip generation for all-purpose attractions. This includes the home-based and the non-home-

EXHIBIT 2

ALL-PURPOSE HOME-BASED PRODUCTIONS

Persons Per Household	Automobiles Per Household		
	0	1	2+
1	1.751	2.316	3.573
2	1.998	4.672	5.453
3	3.550	6.110	8.250
4+	5.494	8.100	12.350

EXHIBIT 3

ALL-PURPOSE PRODUCTIONS/WORK PURPOSE PRODUCTIONS

Persons Per Household	Automobiles Per Household		
	0	1	2^+
1	2.918	2.585	2.084
2	1.998	2.920	2.371
3	2.505	2.716	3.000
4^+	2.970	4.05	4.258

based attractions. Multiple regression techniques using the Biomedical Computer Program BMD02R [9] are used to build the model. This computer program generates a sequence of multiple linear regression equations in a stepwise manner. At each step, one variable is added or deleted to the regression equation. The variable that is added is the one which makes the greatest reduction in the error sum of squares. Equivalently, it is the variable which has the highest partial correlation with the dependent variable partialed on the variables which have already been added.

In the particular analysis, the dependent variable is "y" all-purpose trip attractions. Generally, the expected multiple linear regression equation has the form:

$$y = B_o + B_1x_1 + B_2x_2 + ... + B_nx_m + e$$

where:

y = the dependent variable all-purpose trip attraction

x_1-x_n = the independent variable which are discussed below

B_o-B_n = the regression weights

The first attempt to develop a regression equation used six independent variables which are:

x_1 = total autos

x_2 = total population

x_3 = total employment

x_4 = employment land-use

x_5 = school enrollment

x_6 = work attractions

The GDOT/ARC Zap file of socio-economic data has been utilized as the base for the multiple regression analysis. The Research Team has expanded the Zap file by adding GDOT/ARC developed information concerning trip generation data. No modifications or alterations have been made to these data.

A standard technique to select the variables that should remain in the multiple linear regression equation is plot a of R^2 multiple correlation coefficient for the number of variables. This plot is shown in Exhibit 4. It is evident from an investigation of the graph that the rate of change of R^2 becomes quite small after the inclusion of two variables. This indicates that the optimum number of variables to be included in the equation is two which are work attractions and total population. In addition, a detailed residual analysis has been conducted. It should be recognized that the square of the residuals divided by the degrees of freedom is an estimate of error. Consequently, if the residuals can be reduced in a rational manner, the error estimate will also be reduced.

In the development of a multiple linear regression model, a number of trial runs using the BMD02R program have been performed. A summary table of this analysis is shown in Exhibit 5. It indicates the variables that have been included in the equation, R^2 and the standard error. From the analysis, the equation that is selected for use in this research project is:

$$y = 45.47 + 1.808\ x_6 + 1.419\ x_2$$

Exhibit 4

Multiple Regression Analysis

R^2 Plot

First Attempt

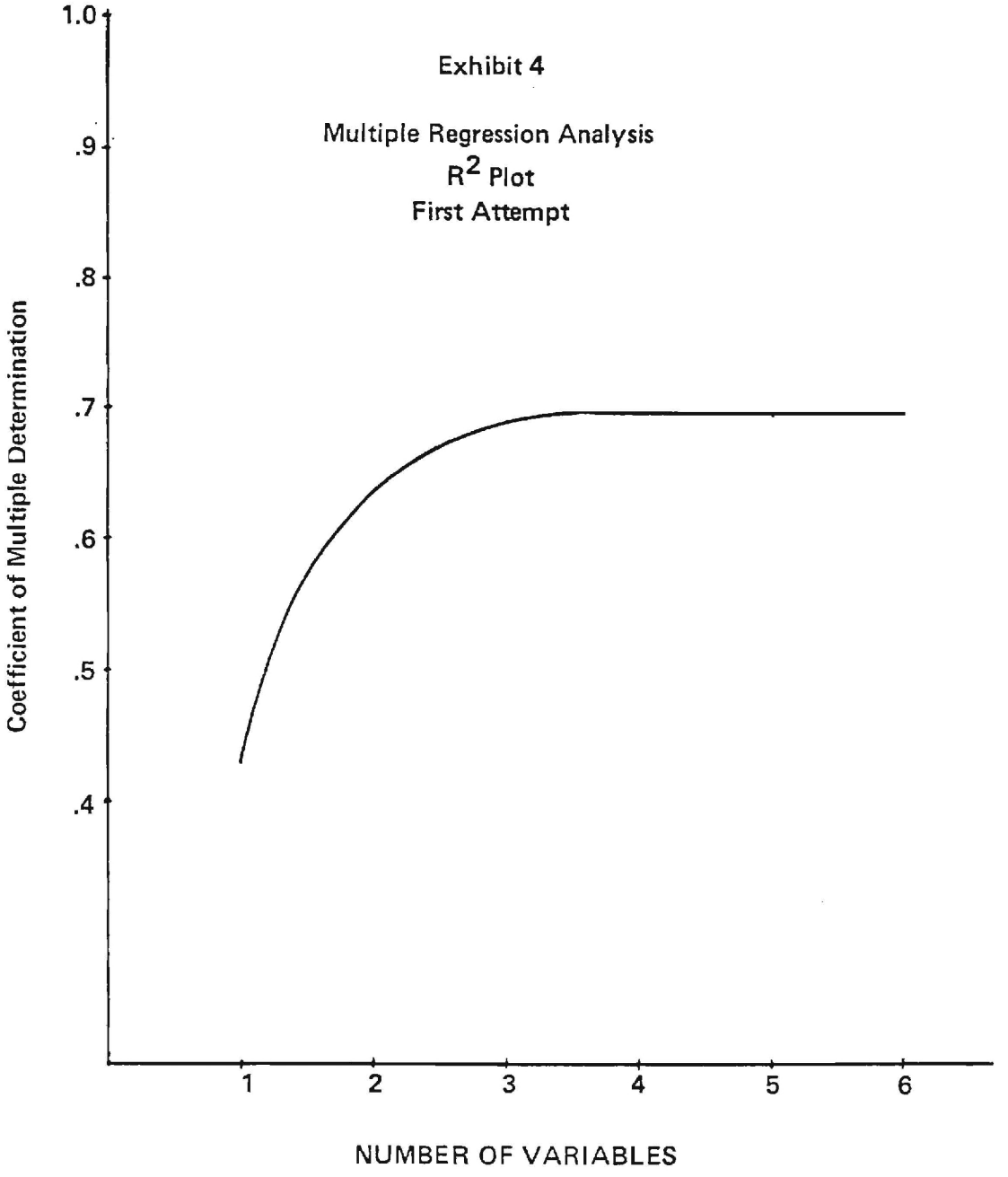

EXHIBIT 5

SUMMARY TABLE OF REGRESSION ANALYSIS

Run Description	Total Attr. Mean	Total Attr. S. D.	Constant	V1	V2	V3	R	R^2	R^2 Change	S. E.
AT TPOP TE ELU SCHL WKATR	9497	8756	4978.8	1.872 (WKATR)			.605	.367	.367	6977
			139.6	1.879 (WKATR)	3.598 (AT)		.778	.605	.239	5515
			47.8	1.790 (WKATR)	2.919 (AT)	137.581 (SCHL)	.814	.662	.057	5108
DELETE AT	9497	8756	4978.8	1.872 (WKATR)			.605	.367	.367	6977
			-222.3	1.899 (WKATR)	1.743 (TPOP)		.761	.579	.212	5698
			-42.8	1.806 (WKATR)	1.351 (TPOP)	135.554 (SCHL)	.795	.631	.053	5336
DELETE AT, TPOP	9497	8756	4978.8	1.872 (WKATR)			.605	.367	.367	6977
			3412.3	1.735 (WKATR)	214.478 (SCHL)		.725	.525	.159	6046
			3005.9	1.592 (WKATR)	200.452 (SCHL)	10.428 (ELU)	.732	.536	.011	5988
CONSIDER TP &				1.828						

where:

y = the dependent variable - all-purpose attraction in each zone

x_6 = the independent variable - total work attractions in each zone

x_2 = the independent variable - total population in each zone

A logical comparison is to analyze this equation versus the various trip generation attraction equations developed by GDOT/ARC. An all-purpose multiple linear equation has intuitive appeal because it represents an aggregate rather than a stratified sample. In this particular comparison, the statistics do not support this hypothesis. If only the statistics are judged, the by-purpose regression equations appear to be better. However, the Research Team's opinion is that this comparison is inconclusive because the bias in the GDOT/ARC equation is unknown. Although the above equation does not have the desired statistics, it has been judged adequate for the development of a research methodology. This conclusion is especially consistent when it is realized that it is beyond the scope of this project to collect the necessary data to build a more precise model. The GDOT/ARC half of one percent origin destination survey is the best data available in the Atlanta region.

Step Four - Development of an All-Purpose Trip Table Using the UTPP File

This step involves the building of an all-purpose trip table using the modified UTPP file, the trip generation equations and the special generator information previously developed by GDOT/ARC. It is a straight-

forward procedure to combine these data and equations and build an all-purpose trip table. A computer program has been devised to perform this task. The 525 x 525 trip table matrix is stored on the Research Team's private disk at the University of Georgia computer site.

THE DICHOTOMY

The objective of this particular research is to develop a peak-hour model methodology using the 1970 Census UTPP file. To reiterate, the UTPP file is a description of the journey-to-work trip by mode of travel. In the case of Atlanta, approximately 56 percent of the trips have been coded to the traffic analysis zone system. The remainder have been coded to dummy numbers that describe a surrogate system.

Just prior to the development of the all-purpose trip table, an intense debate began among the Research Team. The debate centered on the validity of peak-hour model as a function of the UTPP file. All of the models that have been built as well as all work in support of the research effort is based on information developed in the GDOT/ARC transportation planning process. That is to say the peak-hour model developed from the UTPP data is directly dependent on the GDOT/ARC effort. The direction of the debate led the Research Team to re-examine the functional intent of the research effort. This analysis led to the basic conclusion that the UTPP data cannot stand alone but is dependent on calibrated models developed during the traditional transportation planning process. At least this is the case for the methodology pursued by the Research Team.

A point of the debate is that it is inconclusive to perform an

analysis of potential peak-hour model link estimates and actual ground counts. For example if the analysis showed no significant difference between the ground counts and synthetic volumes, it is not possible to discern if the peak hour methodology is adequate or if the traditional models used in support compensate for shortcomings. Likewise, the same inconclusive dilemma would occur if the comparison indicated a significant difference.

This is a perplexing situation since the work trip is well-defined and also a large proportion of these trips are made in the morning and evening peak-hour periods. Furthermore, the sampling rate of the UTPP file is approximately 15 percent, a much larger sample size than Atlanta 1970 half of one percent origin - destination survey.

Because of this reliance on existing models from the traditional planning process, the problems in geocoding the journey-to-work data and the necessary engineering judgement required to completely allocate the UTPP, one may wonder if the transportation questions asked in the Census Instrument are a substitute for the origin-destination study. The answer to this question is inconclusive. Based on the methodology that has been used by the Research Team, the answer would have to be that the UTPP file cannot be substituted for an origin-destination study. However, the Research Team has not examined an exhaustive set of methodologies that equate the journey-to-work trips with all-purpose trips.

This dilemma has been discussed with the Project Advisory Committee. The general consensus was that the project should be stopped without performing an assignment because the effort would not yield a useful result. The Research Team stopped further work on the project

and this report reflects the accomplishments of the project up to the point of termination. A set of recommendations have been developed and are included in the last section of the report. The fact still remains that a peak-hour model applicable to TSM procedures is a valuable tool to the practicing transportation engineer.

CIVIL ENGINEERING MASTER DEGREE SPECIAL RESEARCH PROJECT

The secondary element of this objective is the development of a peak-hour factor methodology that can be used with the traditional transportation planning process. This research is being conducted as a Special Research Problem by a Georgia Tech graduate student in partial fulfillment of a Master of Civil Engineering Degree. This research effort will continue and will not be effected by termination of the peak-hour methodology research.

There are two approaches for developing design hour volumes. The first is to assign ADT volumes to a network and the resultant "smoothed" assignments factored to produce peak-hour volumes. The second approach is to convert the ADT by-purpose trip interchanges in trip table format to peak-hour trip interchanges. After the peak-hour trip interchanges are obtained, they are assigned to the network and the resultant values are a peak-hour assignment.

The Special Research Project will assess:

(a) current methodology that is used in the Atlanta regional planning - Approach One

(b) by-purpose trip interchange peak-hour factors will be developed as a part of the research methodology - Approach Two

A brief description of the two approaches are:

Approach One - assess the design hour factor matrix employed in the Atlanta regional transportation planning process. The matrix which classifies the Atlanta highway sections by area and functional classification will be refined and supplemented with ground count data from Phase I of the present project and factors developed. The research will address the base year design hour factor matrix.

Approach Two - analyze the Atlanta by-purpose trip interchanges:

a. the 1972 home interview origin destination survey for work, school, shopping, social/recreation and non-home based trips.
b. the 1972 truck survey for trucks.
c. the 1972 external survey for internal-external trips.
d. from this analysis develop appropriate peak-hour factors.

The FHWA program PEAKHOUR will be used to process the survey trip records and stratify the data to obtain peak-hour factors. Factors will be established for person trips and auto driver stratified by all-purpose travel. Based on similar peak-hour studies completed in Baltimore, Maryland, the research will incorporate changes in the peak period travel based on regional socio-ecomonic parameters. Peak period travel by-purpose will be examined in terms of trip ends stratified by income, number os autos, employment density, residential density and geographical distribution. The research will attempt to account for variation in peaking characteristics as a function of trip end travel and a knowledge of zonal characteristics. Thirty-four geographical (super-districts) zones has been defined for this analysis. The super-districts will be aggregated if similar peaking characteristics are discovered among the super-districts.

The validity and adequacy of the two approaches will be assessed based on available data in the Atlanta region. A statistical or

graphical method will be employed to evaluate the approaches. When this research is complete, a copy of the final publications will be available to the sponsoring agencies.

To reiterate, this Special Research Project has been created to compliment the analysis of the Census journey-to-work research. Even though Model Development has been terminated, the peak-hour research will continue. The special research and, its findings will be applicable to the on-going transportation planning being conducted by GDOT/ARC.

REVIEW OF THE 1980 CENSUS INSTRUMENT

The second objective of the research has been the investigation of the potential impact that could be made to the transportation questions contained in the 1980 Census Instrument. As of July, 1977, it became highly unlikely that any revisions could be made. But, it is important to discuss the findings of the Research Team as reported in a number of technical memorandums. The following is a discussion of these memoranda.

Transportation related issues first appeared in the 1960 Census Instrument. Again in 1970, transportation questions were asked. Transportation related areas in 1970 dealt with:

(a) The place of work (the question contained the number and street name, name of city, town or village, county, state and zip code).

(b) mode of travel (the question contained the categories of driver private auto, passenger private auto, bus

or streetcar, subway or elevated railroad, taxicab, walked, worked at home and other).

A number of problems were incurred in reducing the 1970 Census data. Most of the problems are related to the difficulties of geocoding.

It is planned by the Bureau of Census to ask transportation related questions in the 1980 instrument. The sample rate will be 1 out of 6 or 16.7 percent. In anticipation of these questions and because of previous problems, extensive efforts have been or are being made to update the Area Coding Guide. If this is accomplished, the geocoding problems will be reduced to a minimum. Further, the Bureau has conducted pretest in Austin, Texas, Oakland, California, and Camden, New Jersey in 1977. In 1978, additional "Dress Rehersals" will be conducted in three cities prior to the actual census in 1980.

The 1980 instrument contains the following questions that are related to the journey-to-work:

(a) Work Location
(b) Modal Split
(c) Auto Occupancy
(d) One-Way Travel Time to Work
(e) One-Way Travel Distance to Work

A copy of the 1978 pretest questionnaire for Richmond, Virginia is attached to the March 20, 1978 technical memorandum. Mr. Turner of the Bureau of Census has indicated that the Richmond, Virginia "Dress Rehersal" format will be the questionnaire that will be submitted to Congress for approval. He implied that this approval is a formality. So it appears reasonable to assume that the 1980 instrument will be the same as the questionnaire used in the "Dress Rehersal".

Early in 1977, the Research Team sent a questionnaire[3] to a number

of individuals concerning the inclusion of the journey-to-work questions in the 1980 Census Instrument. A list of the individuals and a sample questionnaire are contained in the Appendix. The aim of the questionnaire was the determination of the prevailing opinion concerning collecting transportation data through the Census Instrument. A summary of responses is shown in Exhibit 6.

The Exhibit illustrates the question asked, the mode of the response, the inference and the current Bureau of Census Status. The information in the last category indicates whether or not the question area is included in the 1980 instrument. Generally, the Research Team Survey concludes that Census instrument should address question areas number one (destination), number 3 (modal split) and number four (occupancy). Question area number two (nearest intersection), number six (distance to work), and number seven (travel route) should not be included in the Instrument. No conclusions have been derived concerning area number five (travel time) and number eight (time of departures).

Three major conclusions are made in the Stage C Report, Status of Transportation Questions on the 1980 U. S. Census, March, 1978:

1. The final version of the 1980 Census Questionnaire has been set.

2. "Dress Rehersals" will be held on the "short forms" and "long forms" of the Census Questionnaire in three U. S. Cities during 1978.

3. "Great Concern" is the general mood of those who will be using the Census data for transportation planning. These persons are primarily concerned with the coding of the destination portion of the work trip. Previous efforts have been unsatisfactory in the validity and the amount of information provided by the coding effort.

EXHIBIT 6

SUMMARY OF RESPONSES TO WORK TRIP RELATED QUESTIONS FOR THE 1980 CENSUS*

Questions on Area of Interest	Mode	Inference	Current Bureau of Census Status
#1 Destination of Work Trip	Priority #5**	Should be included in Census Instrument	Included
#2 Nearest Intersection to Work	Priority #1	Should not be included in Census Instrument	Not Included
#3 Modal Split	Priority #4 & 5	Should be included in Census Instrument	Included
#4 Occupancy	Priority #4	Should be included in Census Instrument	Included
#5 Travel Time to Work	Priority #4 & 5	No Conclusion	Included
#6 Distance to Work	Priority #1	Should not be included in Census Instrument	Not Included (Could be Deleted)
#7 Travel Route to Work	Priority #1	Should not be included in Census Instrument	Not Included
#8 Time of Departure from Home	Priority #3	No Conclusion	Not Included

* Source: GDOT Report, "Status of the 1980 Census Instrument", May, 1977.

** Gradation as Follows: #1 Low Priority
#5 High Priority

III. CONCLUSIONS AND RECOMMENDATIONS

From an evaluation of the results of the research project in comparison to the detailed work plan, it is plainly obvious that the research goal has only been partially achieved. That is, the research effort did not yield a peak-hour model methodology to estimate design hour volumes applicable to TSM procedures. In fact, a peak-hour model as a function of the UTPP file has not been developed. There are a series of questions that must be answered to explain the rationale of the stated conclusion, i.e.,

- Why and what caused the research effort to fall short of the stated objective?
- Has the research effort been worth the expenditure of resources in terms of manpower and dollars?
- Can a peak-hour model be developed that is directly dependent on the UTPP file?

The remaining portion of this section is the Research Team's response to the above questions. Included in this response is suggested recommendations to continue the analysis and evaluation of the UTPP type data.

Question 1: Why and what caused the research effort to fall short of the stated objective?

To answer this question, it is necessary to regress and reconsider the status of the 1970 UTPP file when the research began. The UTPP file represents the estimate of all one-way journey-to-work trips. It has been developed by the Bureau of Census by expanding the 15 percent sample data collected in the 1970 Census Instrument. Approximately forty-four percent of the trip interchanges are not coded at the destination end of

the work trip. These trips are coded to dummy zones which are zip codes, universal area codes, enumeration districts, or not allocated. It should be noted that the surrogate descriptions do not necessarily coincide with the 525 traffic analysis zones. Consequently, the first problem and a potential source of error is to synthetically distribute the uncoded UTPP trips to the 525 zone system. This procedure is discussed in the body of the report. Since the research is considered an effort to develop a methodology, the possible error resulting from the synthetic distribution of UTPP trips is not considered a significant prohibition.

The major reason that the research effort falls short of the objective is the dependence the research methodology has on other sources of data and models. The UTPP file is solely in terms of the journey-to-work travel. If it is desired to forecast all-purpose trips, it is necessary to develop a technique in which work trips are the predictor random variable. To develop all-purpose travel, the Research Team has used the GDOT/ARC 1972 origin-destination data as the base. All-purpose trip generation technique using a cross-classification technique has been used to predict productions. Similarily, a multiple regression model has been developed to estimate attractions. Both of these models use the half of one percent origin-destination study and both have been generated so that travel to work is a predictor variable.

With the reliance on other data, especially the origin-destination survey, and the experience gained through working with the methodology, the Research Team began questioning the validity of the proposed methodology. The Research Team has argued that it is questionable if the research effort should be continued as a worthwhile investigation.

Consider for a moment how the detailed work plan proposed to evaluate the research results. In Phase I of the project 265 volume count locations are reported. These data would have been compared to the synthetically assigned link volumes. The basic question is how does this evaluation shed any light in recognizing the significance of the research results? If the synthetic and ground counts compared favorably, it could be concluded that methodology is an acceptable procedure. If on the other hand, the comparison is not favorable, it could be concluded that the procedure is not the optimum methodology from which a peak-hour model can be derived. Either conclusion is perhaps correct or erroneous depending on the importance given the UTPP file. In the opinion of the Research Team, the significant dependence GDOT/ARC data and the origin-destination survey prevents a true evaluation of the methodology and UTPP file.

With the research methodology used in the project, the UTPP file is a secondary source that is directly dependent on the previously developed models and data. If this is the correct interpretation of the research results, the UTPP file is supplemental data that is not directly applicable in the transportation planning process. If the research methodology is used, origin-destination data are needed to calibrate models. The UTPP data cannot replace the need for this survey. It can be argued that if origin-destination data are collected, then these data should be collected so that the data can be useful in aggregate or disaggregate procedures not to use the UTPP data. It may not be economically consistent to collect two data sources when the origin-destination data will suffice for the traditional transportation process. If the

disaggregate techniques are used, then that procedure may not need an origin-destination survey.

It should be realized that the arguments put forth in this paper should not be interpreted nor should a conclusion be made to abandon the gathering of the journey-to-work information through the Census Instrument. The total usefulness of the UTPP file has not been researched and the conclusions are limited to the scope of the project and the research methodology employed. The UTPP file provides a wealth of information concerning the journey-to-work trip. The 1980 transportation related information will be obtained from a relatively large sample (16.7%). In addition, the work trip represents a large number of well defined trips usually occuring during the morning and evening peak hours. Perhaps a methodology can be developed that negates the need for an origin-destination survey or the UTPP file can be used directly in disaggregate procedures. These potential uses of the UTPP file require further research so that maximum utilization of the Census data can be achieved.

Question 2: Has the research effort been worth the expenditure of resources in terms of manpower and dollars?

In the opinion of the Research Team, the answer to this question is a definite yes. It is suggested that the research methodology utilized in this project is not the correct method. It points out to other researchers that reliance on other sources of data are required and indicates the supplemental nature of the UTPP data. It also suggests to other researchers the potential pit-falls and troublesome areas that exist in the UTPP data. Some of these areas, particularly the problem with geocoding, may be avoided in the 1980 Census reporting.

If the UTPP file from the 1980 Census is going to be used as a substitute for an origin-destination survey, then a methodology must be

developed that is not heavily dependent on an origin-destination study. This particular research did not meet this particular criterion. It is suggested that further research is mandated if the UTPP file can be used to its fullest potential.

Question 3: Can a peak-hour model be developed that is directly dependent on the UTPP file?

The answer to this question is: "perhaps". However, the research methodology, in the opinion of the Research Team, is not the optimum direction to take. As a supplement product, the research has led to the development of a Special Research Topic for a graduate student at Georgia Tech.

The goal of this special research effort is to develop a set of peak-hour factors that can be used at the by-purpose trip table stage. It is hypothesized that peak-hour factors at this level are more sensitive to actual peaking characteristics. It is anticipated that the factors can be used with the traditional transportation planning process. The special research is an on-going effort. The reader is referred to the separately published report on this work to be made available about December, 1978.

As an overall conclusion, it is recommended that further research be devoted to investigating the uses of the UTPP file. This is especially important because the 1980 UTPP file is expected to be more complete than its predecessor, the 1970 file. It may be an erroneous decision to wait until the 1980 UTPP file has been completed by the Bureau of Census to start the research for an adequate methodology. Proceeding with research in advance of the 1980 Census may assist in shedding sufficient knowledge so that the 1980 Census can be immediately used upon availability. Many urban areas will be in the process of updating their transportation plan at approximately the same time that the 1980 UTPP file becomes available.

If an appropriate forecasting procedure that uses the Census travel data can be found, this information could be a valuable source to the transport analyst.

APPENDIX

RESEARCH TEAM QUESTIONNAIRE LIST

During the project, the Research Team developed a questionnaire to survey the prevailing attitudes concerning the importance of the transportation questions in the 1980 Census Instrument. The list of individuals in the appendix are those who received a questionnaire.

INDIVIDUALS THAT RECEIVED A RESEARCH TEAM QUESTIONNAIRE

AGENCY: Georgia Department of Transportation

Mr. Hugh Tyner
Mr. Dick Graves
Mr. Lamar Caylor
Mr. Robert Seago
Mr. Emery Horvath
Mr. Oscar Roberts
Mr. Robert Bowling

AGENCY: Federal Highway Administration

Mr. Kevin Heanue
Mr. George Schoener
Mr. Constantino Ben
Mr. Glen Price
Mr. James Cooley
Mr. Grover Bowman

AGENCY: Atlanta Regional Commission

Mr. Joel Stone
Mr. John Wilson

AGENCY: Bureau of the Census

Mr. Marshall Turner
Mr. Edward Elam

AGENCY: East-West Gateway Coordinating Council

Mr. Shoab Rana

AGENCY: Comsis Corporation

Mr. Martin Fertal

AGENCY: Metropolitan Washington Council of Governments

Mr. George Wickstrom

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